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MISSOURI BOTANICAL GARDEN BULLETIN

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Missouri Vegetation and an English Mathematician

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Volume XLIV January, 1956 Number 1

Another article about the Ozarks appears in this issue. It is part of a series by various authors presenting different points of view about this interesting region so close to St. Louis — its past, its present, and its future. We are indebted to Leonard Hall not only for the article but for arranging for permission to use the line drawings from the *St. Louis Post Dispatch* and the photograph by Charles Swartz of the Conservation Commission.

COVER:—A farm pond in the Ozarks. Photograph courtesy Radio Station KETC

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Missouri Botanical Garden Bulletin

Vol. XLIV JANUARY, 1956 No.1

THE OZARKS COME BACK

LEONARD HALL, Possum Trot Farm

AND

LEON HORNKOHL, U. S. Forest Service

THERE was a time, long ago, when the Missouri Ozarks was a land of abundance, as pioneer communities know abundance. Then through the years it deteriorated into a place of poverty so that John Gunther was able to designate it, with some truth, one of the "slum citadels of America." Today it is once again a land of hope and restoration where residents look with considerable confidence to a better future. The story of how all this came about lies in the land and the people; but chiefly in the land—using this term in its ecological sense to include the parent rock, soils, water, climate, plants and animals of the region.

It is generally agreed among geologists that the Ozarks comprise one of the oldest land areas on our continent. Originally this land was level and we know that it was inundated in very early times by a succession of inland seas, on the floors of which were laid down thick layers of dolomitic limestones. These were, of course, made up of the skeletal remains of the many life forms which inhabited the waters. Then countless centuries ago—perhaps as much as 500,000,000 years ago—this level plain was pushed upward by violent internal pressures. Mountains were formed which rose 5000 feet or more above the plain; and now the ample rainfall of the region began to cut great gullies and river channels.

Some of the rainfall, however, soaked into the soil — discovering here the cracks in the limestone created by the faulting of the uplift. Mild acids, formed by organic matter in solution, acted slowly to dissolve the rock; and through the milleniums great underground reservoirs and rivers began to form. As surface streams eroding

downward cut across these underground rivers, they emerged as springs along the valleys.

There came a later period when a second uplift occurred, causing the valleys and river channels to dig still deeper into the overburden and the rock formations beneath the plain. Ground water found new cracks in the dolomite at still lower levels and developed a second set of streams and reservoirs at this greater depth. And now the earlier channels above became great caves.

Geologists call this whole Ozark land mass a "plateau," although it is actually a vast system of rivers and gullies or hollows divided by steep ridges. Were it not covered today by a blanket of vegetation, it would be one of the great erosion spectacles of the world; as indeed it must have been, millions of years before man appeared on the scene. There are areas in the Ozarks, as in the St. Francois Mountains of Iron and St. Francois counties, where ridge-tops have eroded down to granite, or even through the granite

ALLEY SPRINGS

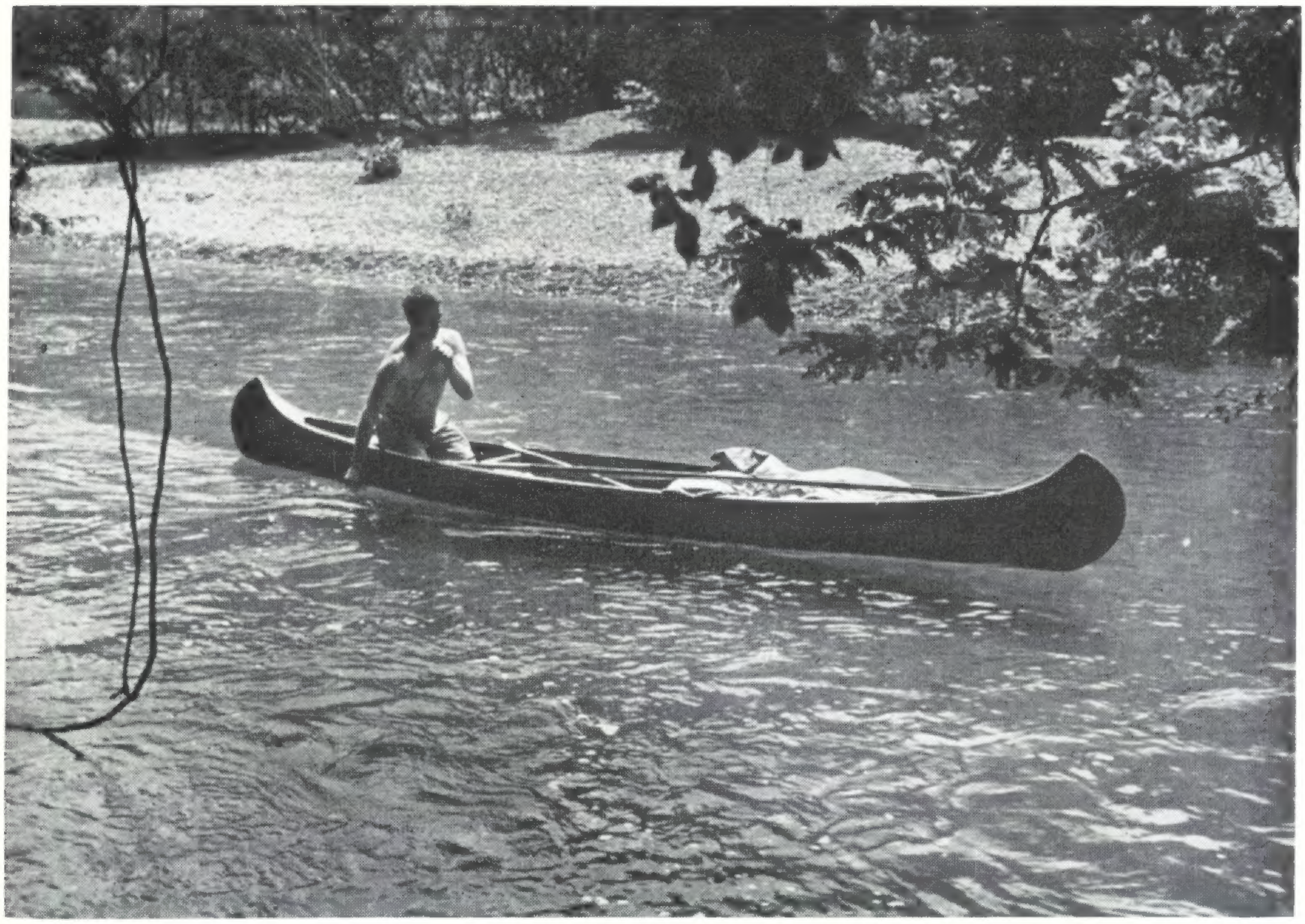
to the igneous rock, fired by the internal heat of the earth. Here the entire overburden has worn away through the centuries, so that the hills have lost several thousand feet of altitude. This erosion has taken place so slowly and over such a long period of time, however, that streams which traverse the Ozark country are not muddy or silt-filled as in areas of recent erosion like the Rockies, but run swift, clear, sparkling and cool.

We think of Ozark soils as poor. Yet this was not always true, for these soils are tremendously old and highly developed, in sharp contrast to the new soils found in the western mountains. These latter have not evolved the complexity to support more than a few species of plants and animals. Ozark soils, on the other hand, are highly complex in their virgin state. At the time the white man arrived in Missouri, they were supporting some 2000 plant species and at least 700 kinds of animals, birds, fishes, reptiles and amphibians.

It is hard to conceive today that when those first white men came they found in Missouri great herds of buffalo, deer, elk and wild turkeys. French traders, with the help of Indian hunters, secured for many years large supplies of wild meat in the grassy openings of the forest like those along St. Francois River and in Belleview Valley. Much of this meat was floated down the Mississippi to New Orleans in great dugout canoes which had a 50-foot length and 5-foot beam and were hollowed from giant cottonwood logs. One early woodsman described the land as "the best in the world for hunting, not even excepting old Kentucky." And fishing in the Ozark rivers was unsurpassed on the continent; the climax species being the black bass.

Much of the Ozark terrain was originally covered with forests of pine, oak, hickory and many other species; yet this forest was open and interspersed with grassy glades and prairies. Settlers found living here as easy as pioneer living can ever be; with the great abundance of fish and game—and plenty of forage for their horses, cattle, sheep and oxen. Eventually they found that hogs throve in the forest, growing fat on oak mast, hickory nuts and other nutritious foods. Thus for many years the people lived from the land, planting few crops except the kitchen garden which supplemented their livelihood from the forest.

As the country became more thickly settled, owners of livestock found that their cattle fared better where the woods had been burned; for on the



JACK'S FORK

Ozark streams are swift and clear, abound in bass and wall-eye.

Photograph by Charles Swartz.

virgin land this released nutrients in the ash to feed the native grasses and legumes. Thus annual burning of the woods "to tame the wildgrass" became a custom of the region which persists in a few places even today. As numbers of livestock increased and pressure on the small forest openings grew greater, trees started to encroach on the glades and natural grass prairies. And burning became a matter of desperate necessity to keep the timber from moving in.

It was not until about 1880 that the Ozark people turned to logging as a primary source of livelihood. The first cutting was in the areas of big pine which was easily turned into saw lumber and found a ready sale in the towns of the region. But it wasn't long until the cutting extended to white oak for bourbon barrels, hickory for handle stocks, oak for railroad ties and mine props—and small trees of all species for charcoal. Timber cutting in the Ozarks has always been characterized by "high-grading," cutting the best and leaving the worst until nothing but "worst" was left. Another honored custom was "Grand-mawing," which simply meant cutting trees on someone else's land and reporting to the sawmill that the logs had been cut "out on Grand-maw's place." And always the livestock farmer followed the unwise and wasteful cutting with fires in the slash to make the grass grow. What he didn't know was that fire killed out the deep-rooted and nutritious native grasses and legumes

GRANITE AND PORPHYRY ON THE ST. FRANCOIS RANGE.

—and encouraged the little annuals which sprout green in May and die with the first hot weather of July.

Real farming of the cut-over Ozark lands is a fairly recent innovation, the original method of cultivation having been to grow a kitchen garden and patch of corn in the creek-bottom as winter feed for hogs and cattle. No effort was made to husband the fertility of the soil and finally even the rich bottom fields were worn out, washed away by flash floods or so covered with gravel as to become almost barren. This kind of damage became worse and worse as the naked hills caused greater run-off and worse and more frequent floods. The thin land of the upper hills was abandoned when it failed to produce and new cut-over land was grubbed off for plowing. It is estimated that more than 25 per cent of the Ozark land, much of it long since abandoned, has been cleared and cultivated at one time or another.

As a result of this kind of logging and farming use—which might better be called abuse—the thin topsoil layer of 4 to 10 inches was eroded from the hills, leaving a mantle of useless white chert over much of the area. Now the rains, instead of soaking into the ground, ran off as overland flow. Stream channels once rich in aquatic life became choked with sterile gravel washed down from the hillsides. Fishing became almost a sport of the past and was no longer a reliable source of

EROSION PROBLEM IN THE OZARKS

food. The abundant grasses and shrubs on which the game herds had flourished were now gone, replaced by a dense and fire-scarred second-growth of such inferior species as post oak, black jack oak and hickory. Elk, buffalo, bear, beaver and passenger pigeon had long since disappeared entirely—and now the deer, turkey and small game species seemed on the road to extinction. The cattle industry, the timber industry, the tillable lands, the hunting and fishing—all the resources on which the Ozark people depended for a livelihood—were playing out.

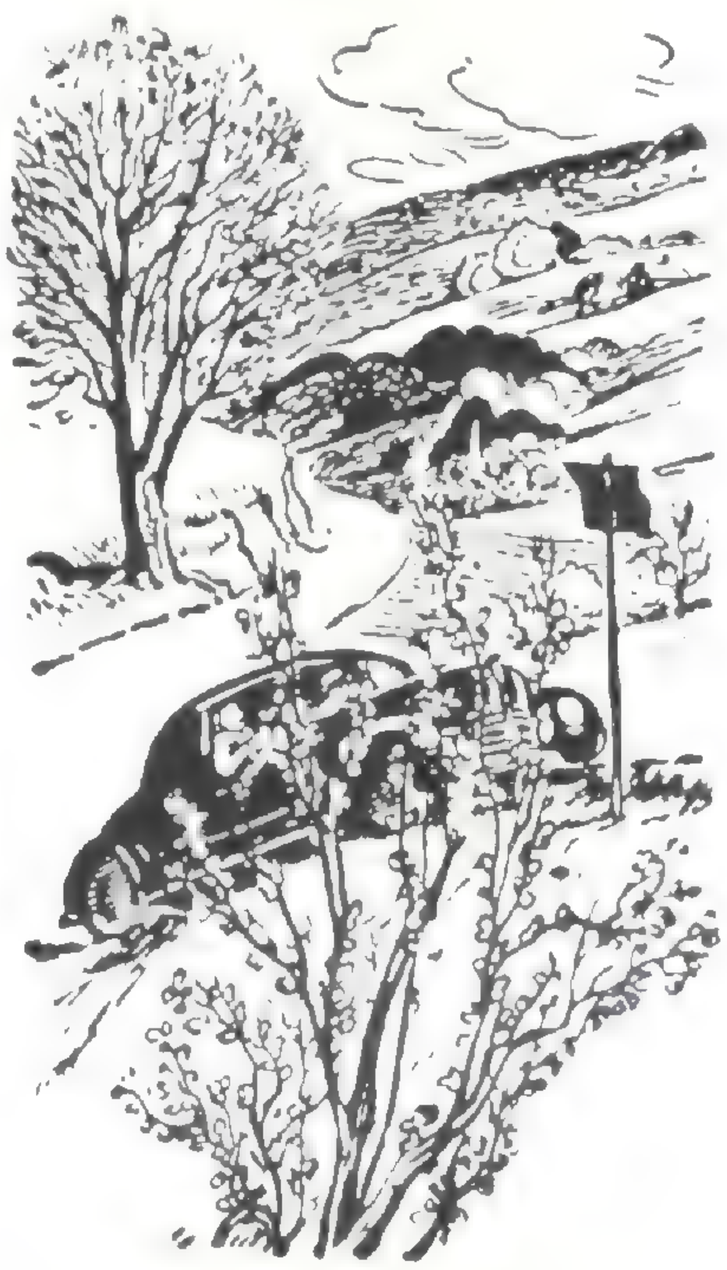
In addition to these ills, the hard-packed and barren soils which had been deprived for a full century of their annual accumulation of litter were sick. No longer could they soak up rainfall, and now the life-sustaining substance of the land was leached and eroded away. Along with soil erosion, the substance which gives people the initiative and incentive to go ahead was also eroding away. With less rain soaking into the ground, ever-flowing streams and springs now ran intermittently. When rain came, it ran off in great gushes, causing floods and destruction in the lower valleys.

This was the state of the Ozarks in the early 1930's when at least a few Missourians began to be concerned about their failing resources. In those years, new laws were passed which made it possible for the Federal government to accumulate cut-over acre-

age in Missouri, and as a result two National Forests were established These eventually embraced some 1,600,000 acres in 14 Ozark counties. At about the same time, Missouri passed the Constitutional Amendment creating her now nationally famous non-partisan Conservation Commission, charged with the proper and scientific management of all the natural resources of the state. One of the first things developed by the Commission was its Forestry Division, headed and staffed by trained foresters.

These agencies of the state and federal governments brought new knowledge and concepts to bear on the problems of the forested hill country. Both were by nature opposed to fire, over-grazing, timber and watershed destruction. Both rapidly developed programs of education designed to inform the Ozark people of the need to conserve soil, water and forest cover. Both had the personnel necessary to cooperate with any and all individuals and organizations interested in the preservation of the forest resources. With the Forest Service came the Civilian Conservation Corps to work at road-building, tree planting and many other projects. Fire observation towers were erected on the National Forests and on State lands, telephone lines constructed and fire fighting crews built to combat the ever-present danger from forest fires.

There was a period of several years when the century-old custom of burning the woods continued to prevail. As late as 1936, forest rangers and CCC boys fought day and night throughout the fire season of spring and autumn, and it sometimes seemed as though no progress whatever was being made and that the problem of woods burning would never be solved. And yet today it seems plain that those of us directly concerned were simply so close to the problem that we "couldn't see the trees for the woods." Year by year, the acreage burned in the fire season went down. Small trained crews today are able to suppress the far smaller number of fires. Each year the Conservation Commission increases the amount of private land within its Fire Protection Districts and gets better cooperation from local residents, while fire is no longer a major problem on the National Forests. Now and then we'll still have a big fire of incendiary origin, set in a sort of rebellion against authority or because of a grudge between neighbors, but these are in the minority. Accidental fires from spring trash burning, campfires or cigarettes



still occur but seldom get far out of control.

There are many reasons for the better fire record. Good livestock prices during the late 1940's, plus "improved pasture programs" sponsored by the agricultural agencies proved to most farmers that they couldn't afford to let valuable stock run wild in the woods. Youngsters in every rural school took home to their parents new knowledge of what actually happens when the woods are burned each year. On the National Forests, timber growth reached the point where rural people found employment in the harvest; cutting the logs, hauling and working in the sawmills. Public sentiment now frowned on woods burning, and farmers and townsmen allied to suppress fires when they started.

During the first years of the new conservation program, results seemed to be coming slowly. On the poor, eroded National Forest lands there was little or no marketable timber left; while on private lands the tendency was still to cut each tree the moment it would make a railroad tie, 8-foot saw-log or even fence-post or mine-

prop. Yet in lands protected from grazing, fire and over-cutting, a change was taking place. One of the interesting jobs undertaken by the U. S. Forest Service on their lands was the harvest of such old fire-scarred trees as would make some lumber. As this was sold and removed, part of the proceeds were used for girdling the remaining cull trees wherever there were good stands of young timber—and even chopping out of the undesirable "weed" species.

This release work, known as TSI or Timber Stand Improvement, returned countless tons of organic matter to the forest floor and released plant nutrients which had been tied up in the old cull trees for a half century or more. Added to the annual litter which was no longer burned, this brought about a rebirth of soil fauna and flora which set to work to turn the woody plant residues into humus. Young oak and pine, with room above them to reach for the sun, and nutrients beneath them to feed on, doubled or even tripled in growth. Today this growth has reached a point where annual harvest of good saw-timber from the National Forests is approaching 50 million board feet per year, with a total value of about $500,000. Meanwhile the growth of timber for future harvest greatly exceeds this.

The record on privately owned timber lands in Missouri, unfortunately, is still not this good. Yet there are some tracts being well managed for future production and a larger acreage each year comes under the timber-farming program made possible by Missouri's forward-looking Forest Crop Law. Under this law, forest land which is protected from fire and over-grazing and on which timber is allowed to grow for selective harvest is given certain advantages. It is given a nominal valuation and tax rate during the years of growth, and the owner then pays a severance tax when timber is harvested, this tax based on the yield.

(To be continued)

MISSOURI VEGETATION AND AN ENGLISH MATHEMATICIAN

EDGAR ANDERSON

I SUPPOSE it was from Sir Ronald Fisher that I acquired the odd, but effective, approach to biological problems of paying particular attention to what does *not* happen. Sir Ronald is the distinguished statistician, biologist, and natural philosopher with whom I spent part of my fellowship year in England in 1929-30. Though I cannot remember that we ever talked about it at the time, he has written in the introduction to one of his books that mathematicians differ from biologists not in the vigor of their minds but in the way they use them. Mathematicians, he writes, frequently operate by considering what does not happen, figuring out the consequences if it did, and from this round-about angle getting at the truth of the matter; biologists, he says, almost never use such an approach.

A typical example of this mathematical approach to a biological problem is the question I used to assign early each term in a course for amateurs in the Henry Shaw School of Botany at Washington University. "As you drive about the country side," I told them, "it's easy to keep your eye on the red cedars, particularly in the winter time. The chief question for your final exam is going to be: In what kinds of places in Missouri are there red cedars and in what kinds are there none? Why are they where they are and *why are they not where they are not?*" Given just a few hints, it was possible for most of the students to piece together from their own observations a pretty good beginning to an answer for this double-barreled question. A complete answer involves you in a very large problem (or net of problems) but by observation and deduction one can get quite a way into it.

One fact is pretty obvious. Red cedars are largely planted by birds. Young cedars come up in places where birds have been perching after they fed on the spicy gray-blue cedar berries. One repeatedly sees little cedar trees sprouting up alongside fence lines, particularly near the posts which make the best perching places. An old slippery-elm tree with wide spreading branches may eventually shelter a whole thicket of little cedars where the birds have dropped the seeds. Pastures do not begin to be dotted with cedars until enough old weeds are left unmowed to offer places where robins and bluebirds and cedar waxwings can alight and void some of the hard seeds from the cedars on which they fed.

Another point which one can figure out for himself is that cedars cannot tolerate very much shade and that the older they get the stronger is this thirst for sunlight. They may come up in the shade of a larger tree, but unless the tree dies or is cut down they do not live to maturity. In a deserted pasture they will grow rapidly in close competition with young oaks and hickories. In the early stages of reforestation there may even be more cedars than oaks on some hillsides but when

the broad-leaved trees grow high enough to shade the cedars, the latter pass out of the picture very quickly. Woodlands which have been so heavily pastured as to kill out most of the undergrowth and let in a lot of light may come up pretty thick with cedars but if the cattle are removed from the area the cedars die out when the shade thickens up again.

With this background of observation one begins to understand why cedars are so conspicuous on cliff edges and rocky hillsides. It is not that they really prefer the soil on such sites. Transplant one to a farmhouse lawn with good soil. So long as you give it plenty of air and sunlight it will grow faster and make a larger tree than its former companions up along the cliff. No indeed, red cedars have no inherent need of the barren conditions under which they often live. It is simply that under those extremes they can take it and most other trees cannot. There they have little competition except from each other.

This was a pretty good question, you see, to ask a group of interested amateurs. It is the kind of question which if a really good student once comes to grips with he will keep turning over in his mind for the rest of his life. The red cedar problem had a lot of angles, so many that it was quite as good a problem for the professor to think about as it was for the class. Intolerance of shade and the relation to birds are only two factors in the problem; there are many others, some of which still puzzle me. One in particular I should like to attack in a detailed, experimental way. That is, the various kinds of reactions of the red cedar to city conditions. It is well known, in a general way, that few conifers like city smoke, but the relation of red cedars to man is a many-faceted one. Smoke is only one element. Way out in the suburbs where the cedars look green and healthy they are being affected in other ways. This is a problem one can study every time he drives back into town from a trip in the country. Driving into the city one passes through the following zones:

1. Cedars healthy; seedlings coming up vigorously.
2. Cedars healthy; occasional seedlings.
3. Cedars healthy; no young self-sown seedlings.
4. Cedars fairly attractive if well cared for.
5. Cedars persisting in gardens when planted but obviously affected by city conditions.
6. No cedars.

The surprising part of the problem is how far out in the country zones 2 and 3 already extend. Of man's various impacts upon the countryside, which one or ones is responsible for stopping the cedars from reproducing themselves at the very edge of the city (zone 2 now falls between Ladue and Chesterfield), stopping not only the cedars but many other plants as well? Some of the plants in our flora are much less sensitive to man than the cedars, some much much more so. Every one which I have studied carefully is affected in some way or another. Nothing in the entire flora is

quite indifferent to man. If, for instance, you know the Korean Lespedeza, you can see the facts for yourself. It is an introduced plant but it reacts in much the same way as the native red cedars, though it is not so sensitive and spreads farther into the suburban area.

For a botanical garden well inside the city these are more than philosophical problems; they are of the utmost practicality. How are we to keep alive, in the middle of the city, something of the country? The harder it becomes to carry out such a program, the more important it is that we should keep on trying. On the one hand, we make headway both at the practical problems of caring for such areas and the scientific problems of why these plants react as they do. On the other hand, we keep alive for those who live and work in the city something, which if it is really not a piece of the country any more, still gives that effect to the casual passer-by.

BOOK REVIEW:—

Plant Propagation Practices, by James S. Wells. 344 pages. The Macmillan Co. New York, 1955. Price $7.50.

To plant propagators, the introduction of synthetic growth hormones, polyethylene plastic, and mist-making devices, over the past few years, looks like the discovery of the century. For all their astuteness, these artisans of the scion have not advanced greatly their basic methods in controlling heat, light, and water since the introduction of the Wardian case a hundred years ago. Now, almost over night, the use of these recently introduced materials has alleviated several of the inherent shortcomings long troublesome to propagators, particularly in rooting cuttings.

In the opinion of this reviewer, *Plant Propagation Practices* is an extraordinary and timely book. Mr. Wells writes from personal experience, and in most instances his conclusions are based upon carefully documented experiments. Particular emphasis is laid upon rooting cuttings by the new methods, although much basic material needed for a proper understanding of plant propagation in general is included.

Mr. Wells discusses with considerable verve a subject he has known since childhood, first in England under his father who was a "plantsman of the old school," and then in his own private nursery. Before coming to the United States, he was awarded the National Diploma of Horticulture, with honors, which is the highest award given by the Royal Horticultural Society in England. Since 1946, Mr. Wells has been employed as a propagator in several leading nurseries in eastern United States and in the Midwest where he has aroused considerable enthusiasm in the newer methods of plant propagation.

This book, in the words of the author, is written especially for "the young nurseryman who has recently decided to do some of his own plant propagation." It is well produced with an appealing format. Nearly 100 photographs and diagrams illustrate the text, and although the photographs are of varying quality the diagrams are generally well executed and clear. In my opinion, the photographs of grafting techniques would have been clearer as diagrams.

Mr. Wells' book should be considered more in the light of a handbook than a textbook. It is divided into five parts, thirty-two chapters and 327 pages of text.

Part 1 deals with the propagating unit itself, how to set it up and the equipment needed.

Part 2 is the shortest and the only theoretical part of the book but perhaps the most important in some respects. The significance of the photosynthetic process is clearly reaffirmed, and the basic requirements for plant growth, i.e. water, heat, and light, are rendered in sufficient detail for a clear understanding by the propagator.

Part 3 concerns propagating procedures. Under this heading, eight chapters cover seeding, propagation of cuttings, aids to rooting cuttings, humidification and constant mist, grafting, layering and division, pests and diseases, and the production of the

liner for field planting. The most important factors for taking cuttings, in the estimation of Mr. Wells, are timing (preferably before 9 A. M. for most plants), the correct rooting medium, and the follow-up in maintaining the proper balance of heat, light, and water for rooting. The chapter on aids to rooting cuttings lists 125 kinds of trees and shrubs and the proper hormone treatment for each. The reader should note, especially, the efficacy in using stronger hormone concentrations, such as 2 per cent indolbutyric acid for rooting certain kinds of difficult-to-root plants. Considerable emphasis is laid upon wounding many kinds of cuttings prior to treating with hormone powder. Regarding humidification, the use of intermittent mist for summer-time propagation of softwood cuttings introduces one of the newest follow-up methods yet devised for regulating humidity and temperature under full sunlight. By this method, many kinds of plants, such as magnolia, dogwood, and Japanese maples, long propagated on a commercial scale only by grafting, can now be rooted almost 100 per cent during the summer from softwood cuttings in full sunlight under a mist setup. The fact that hybrid French lilac cuttings taken in late spring can now be rooted successfully under intermittent mist fully justifies the use of this method for propagating "own root" lilacs. These and other examples lend to the book an extremely fresh and practical approach for the professional and amateur propagator alike.

Part 4 may be the most interesting for many readers who want to get down to the business of propagating specific kinds of plants. At this point, in a series of chapters, Mr. Wells discusses his results in propagating Japanese Maples, Azaleas, Boxwood, Camellias, Cypress, Dogwood, American Holly, Junipers, Magnolias, Rhododendrons, Hybrid French Lilacs, Yew, and Arborvitae. His experiments in rooting these plants by the newer methods is sometimes spectacular and most revealing for the would-be propagator with the view of profit in mind.

Part 5 presents a useful month-by-month work schedule for propagating various kinds of plants over the entire year. Information of this sort is not of easy access.

A most useful appendix lists sources for obtaining most of the materials used in the new propagation techniques by Mr. Wells, plus a number of pertinent references to recent literature on propagation practices. The veteran and amateur home gardener alike will find it difficult to lay down the book until the last chapter is finished.

F. G. Meyer

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (April to November) and until six (November to April) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN

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Botanical Gardens in Ancient Mexico — Growing an Orchid Plant

Balkan Holly (*Ilex aquifolium* var. *angustifolium*)

olume XLIV — February, 1956 — Number 2

COVER: The "Hand-flower Tree" (Macpalxochiquahuitl) of the Aztecs. The finger, or claw-like structures are stamens equipped with hooked appendages. *Cheirostemon platanoides* (*Cheiranthodendron larreategui*), from *Flore des Serres et des Jardins de l'Europe*. Vol. 7, opp. p. 7. 1851-1852.

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BOTANICAL GARDENS IN ANCIENT MEXICO*

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"THE first step in the process of making science", says Singer, in his *History of Biology* "is the systematic collection of facts. In biology, this is especially aided by botanical and zoological gardens. The habit of forming them is of great antiquity. We hear of them from Pliny." Others go back even farther and give the right of priority to Aristotle, as the founder of a botanical garden in about 350 B.C. But it is the year 1543 which is generally accepted as marking the establishment of the first modern botanical garden. The place was Pisa, Italy, and the credit goes to Grand Duke Cosmo de Medici I. Also, in the 16th century, according to Singer, early attempts were made to acclimatize exotic plants.

It is, therefore, of considerable interest to learn that, before Columbus discovered America, there already existed in Mexico gardens that might, in many respects, be considered botanical gardens. For example, the famous gardens of Netzahualcóyotl, king of Texcoco (of whom more later), were already in existence by the middle of the 15th century. And, according to Fernando de Alva Ixtlixochitl, a direct descendant of the Texcocan rulers, several of the gardens had belonged to Netzahualcóyotl's father and grandfather before him. Clavigero, in his *Storia Antica del Messico*, goes back to the era before the Aztecs, to show that their predecessors, the Chichimecas, had gardens before the Aztecs arrived, and that for a long time they used no human sacrifices, but offered in their temples only herbs, flowers, fruits and copal for incense. Paso y Troncoso traces gardens back even farther, to the Toltecs, and cites tradition in Michoacán to the effect that the monarchs of Tzintzuntzán, the empire of another group of Indians, the Tarascans, maintained gardens in the hills near Pátzcuaro where they, too, grew all the medicinal plants known to their people.

As in the European gardens, medicinal plants were a conspicuous element in the early Mexican gardens. Although, according to the noted Mexican naturalist, Dr. Manuel Mald-

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From Solis y Rivadeynera, *Historia de la Conquista de México*, pp. 460–461. (1684). Typical of illustrations based more on fancy than on fact. The letters are supposed to represent the following:

A. Texcoco — northeast of Mexico City
B. The principal avenue into the city
D. Ixtapalapa — southeast of Mexico City
E. Mexico City
F. Aqueduct
G. Covoacan, south of Mexico city
K. Xochimilco
L. Other avenues

Any attempt to correlate the places listed in the illustrations with their localities can only result in complete frustration.

onado Koerdell, the Mexicans may not have equalled their European contemporaries in general knowledge, they were far advanced in their understanding of the curative properties of various plants. Dr. Emma Walcott Emmart, editor of the 1940 edition of the so-called *Badianus Manuscript*, concurs in that view. "Few countries in the world", she says, "can boast of such an extensive knowledge of native herb remedies as existed among the Nahuatl speaking people." In the development of this knowledge it would seem quite likely that the royal gardens of the Mexicans played a very important role.

EARLIEST REPORTS

On what do we base our knowledge of these gardens? The earliest reports come from the letters that Hernán Córtes himself sent to the King of Spain. These "Cartas de Relación", as they are called, cover the period from July 10, 1519, to September 3, 1526, and have been translated into many languages and printed in many editions. There were five letters altogether, and in the second of these, where Cortes described his march from Veracruz to Mexico City, we find our first reference to a Mexican garden.

This was a garden located at Ixtapalapa on the outskirts of Mexico City, in the palace of Cuitlahuatzin, brother of Moctezuma, the Aztec emperor. Here, in the last of the gardens to be built, Cortes spent the night just before his triumphal entry into the capital city of the Aztecs, and he describes what he saw as follows: "There are . . . very refreshing gardens with many trees and sweet scented flowers . . . He (Cuitlahuatzin), has also a large orchard near the house, overlooking a high terrace, with many beautiful corridors and rooms . . . toward the wall of the garden are hedges of lattice work made of cane, behind which are all sorts of plantations of trees and aromatic herbs."

From the botanical point of view, this description certainly leaves much to be desired and many have wished, with Prescott, that some one like Fernández de Oviedo had accompanied Cortes on his Mexican adventure, for then we might have had more meaningful descriptions of the plants found in these early Mexican gardens.

The gardens at Ixtapalapa made a strong impression, too, on another of the conquistadores, Bernal Díaz del Castillo, who waited almost fifty years to write his *True History of the Conquest of Mexico.* Although there are some who criticise his writings as crude and boastful, most readers view the efforts of this soldier-author, relying on his memories, as an extraordinarily fresh and vivid account of the events of those bygone days. Of the gardens at Ixtapalapa he says, "The garden and orchard are most admirable. I saw and walked about in them and could not satiate myself sufficiently looking at the many kinds of trees and enjoying the perfumes of each. There were walks bordered with the roses of this country, and flowers and many fruit trees and flowering shrubs . . ."

MOCTEZUMA'S GARDENS

If such glowing terms as these could be used to describe the gardens of Moctezuma's brother, imagine how splendid must have been the gardens of Moctezuma himself! For a general description of the Mexican royal gardens we turn first to the Franciscan monk, Toribio de Benavente, or Motolinia, as he preferred to be known. He was one of the group of missionaries who came to Mexico shortly after the Conquest, and in 1541 he wrote his *Historia de los Indios de la Nueva España.* In it we find the following: "The greater part of the city was surrounded by fresh water and contained many cool groves of cedars, cypresses, willows and flowering trees. The Indian lords do not try to raise fruit trees because fruit is brought to them by their vassals, but rather forest trees from which they can pluck flowers." Farther on, the King is quoted as having said, "The raising of plants for food is not the concern of rulers but that of slaves or merchants." This idea is repeated by Antonio Solis in his *Historia de la Conquista de Mexico.* In describing the gardens of Moctezuma in Tenochtitlán (Mexico City), he says: "In all their houses they had large gardens carefully cultivated. All around were flowers of rare diversity and fragrance, and medicinal herbs which were used in flower beds and

Part of remaining row of ahahuetes at the "Bosque del Cuntador", planted by Nezahualcoyotl about 1450. From Nuttall, *The Gardens of Ancient Mexico* (Ann. Rept. Smithson. Inst. 1923, pl. 1. 1925).

bowers. These were given much care, and arrangements were made to have brought to the garden all the kinds of plants that this benign land produces. Here the physicians learned the names of the plants and an understanding of their virtues. They had herbs for all ills and ailments, and from the juices . . . they prepared their remedies." Then Solis repeats the point made by Motolinia: "But they did not like fruit trees nor edible plants in their places of recreation. In days gone by they used to say that orchards belonged to ordinary people, and it seemed more appropriate among the princes that their pleasures should not be marred by ideas of utility."

Bernal Díaz in describing the palace of Moctezuma, does not forget the gardens:

> "We must not forget the gardens of flowers and sweet scented trees, and the many kinds that there were of them, and the arrangement of them and the walks, and the ponds and tanks of fresh water where the water entered at one end and flowed out of the other; and the baths which he had there, and the variety of small birds that nested in the branches, and medicinal and useful herbs that were in the gardens. It was a wonder to see, and to take care of it there were many gardeners."

Francisco Cervántes de Salazar, another friend of Córtes and official chronicler of the city of Mexico, wrote his *Crónica de Nueva España* in 1560-1567. (This work, once thought lost was rediscovered by Zelia Nuttall in 1911, in Madrid.) In it we find specific references to Moctezuma's various gardens: one in the center of the capital city, Tenochtitlán; another to the west of the city, on the slopes of Grasshopper Hill, or Chapultepec (to use its Aztec name); a third, at a site called El Peñon, in the midst of the lake of Mexico, noted for its hot springs and thermal baths; and a

fourth, in Atlixco, used as a hunting preserve. An interesting map, attributed to Córtes, and first published in Nurnberg in 1524, in the Latin translation of Córtes' second and third letters by Pedro de Savorgnani, shows the house and gardens of Moctezuma outside the city, and the new palace within the city, also with an adjoining garden.

According to Cervantes, "This great monarch had many pleasances and spacious gardens with paths and channels for irrigation. These gardens contained only medicinal and aromatic herbs, flowers, native roses and trees with fragrant blossoms, of which there are many kinds." In another of his works, *México en 1554,* Cervantes says, "On the top of the hill Montezuma had cultivated trees as if it were a garden, and on its steep sides were terraces with other groves of trees and hanging gardens." He, too, reports that Moctezuma had ordered his physicians to experiment with the medicinal herbs and to employ those best known and tried, as remedies in healing the ills of the lords of his court.

Of special interest is Cervantes' description of the period when Córtes held Moctezuma prisoner. He tells how the Aztec emperor was occasionally given permission to visit one of his gardens for rest and solace. At such time he generally chose the beautiful gardens in near-by Chapultepec, many of whose magnificent ahuehuete trees (*Taxodium mucronatum*) are still in existence. One can imagine the captive Moctezuma walking disconsolately beneath these green giants, while his thoughts turned, perhaps, to those days when he was all-powerful and he had only to wish for something and his wish was granted. Perhaps he recalled the time when he heard of a king named Malinal, who lived south of Tenochtitlán, near Oaxaca, at a place called Tlaxiaco. Among the treasured possessions of this king, it was reported, there was a beautiful tree called in Nahuatl "tlapalixquixochitl", or "tree of many red flowers". (This is, according to Dr. Faustino Miranda, perhaps a variety of the tree known today as "huanita", *Bourreria huanita.*) Moctezuma sent a demand to Malinal for this tree but surprisingly Malinal refused the request. Upon which Moctezuma promptly sent an armed force to Oaxaca. His men vanquished the troops of Malinal and returned to Mexico with the tree, and presumably with many captives besides.

THE GARDENS AT HUAXTEPEC

Moctezuma's finest gardens, which he had inherited from his predecessor, Moctezuma the Elder, were located at some distance from the capital, in Huaxtepec. The story of their founding is in Diego Durán's *Historia de los Indios de Nueva España* and in Hernando Alvarado Tezozomoc's *Crónica Mexicana.* Both tell how the elder Moctezuma, when reminded that, in the past, his ancestors had once inhabited that delightful area around Huaxtepec, decided to establish a garden there. First he sent to Cuetlaxtlán* along the coast for various plants.

* According to Henry Bruman, this locality is known today as Coatáxtla.

Among those which arrived were "yoloxóchitl" (*Talauma mexicana*, the Mexican magnolia), "cacaloxúchitl" (*Plumeria*, known as frangi-pani in many tropical areas today), and "huacaxóchitl" (one of the Araceae). All these three plants were reserved for the exclusive use of the rulers. Others were "cacahuaxochitl" (Quararibea), "tlilxóchitl" (vanilla), "ixquixóchitl" (the aforementioned Bourreria), "mecaxóchitl" (Piper), and many others. The plants were sent carefully prepared, the roots covered with soil and wrapped, and the Indian gardeners who accompanied the plants took such good care of them, and the land was so fertile and well watered that in less than three years all the plants had flowered and not one had been lost. All this caused much wonder among the gardeners for, it seemed, the plants grew better at Huaxtepec than they had in their native habitat.

Another description of Oaxtepec, as it is sometimes spelled, is found in a group of reports written toward the close of the 16th century. These reports are called "Relaciones" and contain answers to a series of questions, covering every aspect of the land and its resources, as well as the life of the people and their culture. As an example, the Relación for Oaxtepec (also written Guastepeque) which was prepared in 1580, states, among other things, that although the inhabitants did not pay tribute to "Motenzuma", they did accompany him on expeditions to Chiapas and Veracruz, and when they returned they brought with them various trees, among them cacao and "batey". The latter was the tree from which they extracted rubber (*Castilla elastica?*), says the report. And, it continues, "Motenzuma ordered them to be planted in this village, in a woods near by in a ravine, which spot was to serve later for his recreation."

Huaxtepec, too, came in for its share of extravagant praise from Díaz del Castillo. "It is the finest that I have seen in all my life", he says and quotes Captain Sandoval (who, on an expedition to the "tierra caliente", was the first to see Huaxtepec), as calling it the most beautiful garden he had seen in New Spain. He then cites Córtes as stating that "he had never seen a finer garden in Castille." Córtes corroborates this by writing in his third letter that the garden is the "best, most beautiful and refreshing that I have ever seen. A very pretty rivulet with high banks runs through it from one end to another. In it are an infinite number of trees with varied fruits, many herbs and fragrant flowers."

Still another report on Huaxtepec comes from Dr. Francisco Hernández, who was in Mexico on a mission from the King of Spain at about the time Díaz del Castillo was writing his memoirs. Commissioned by Philip II to prepare a report on New Spain which would cover the natural resources of the area and its political history, Hernández arrived in Mexico in 1570. He spent the next five years traveling over a very considerable part of México and, of course, visited all the important gardens then in existence. In Ixtapalapa, for example, he noted much of interest, particularly

From E. Stahl, *Mexicanische Nadelholzer* (in *Vegetationsbilder*, edited by G. Karsten and H. Schenck, 2 Reihe, Heft 3, tafel 15). *Taxodium mucronatum* Tenore, the "ahuehuete" of the Aztecs, in Chapultepec, Mexico. Spanish moss hangs from the branches.

a large "tlatzcan", or cypress tree. (This is identified by Dr. Miranda as probably *Cupressus Lindleyi*.)

Huaxtepec, of course, provided Hernández with much important information for his studies of Mexican plants. Unfortunately, his work was not printed until almost a hundred years later and then in a much modified version. A copy of this version, in manuscript, fell into the hands of a Dominican priest, Francisco Ximénez, who lived at Huaxtepec, in the Hospital de los Hipolitos, founded there shortly after the Conquest. Ximénez added to the manuscript from his own knowledge of the plants of the country and, in 1615, published his highly interesting "Quatro Libros de la Naturaleza." In it we find mention of many plants of medicinal value, among them "bálsamo de las Indias", or "hoitzilóxitl" (*Myroxylon balsamum* var. *Pereirae*) and Cheiranthodendron, the hand flower tree, "macpalxochiquahuitl". According to Cla-

vigero, in 1780, medicinal plants were still being cultivated in the gardens at Huaxtepec and were being used in the hospital.

Hernández was deeply impressed, too, by the part that flowers played in the court ritual. He says that among the Aztecs it was a sign of respect to bring flowers when calling on some one, particularly if that someone were the King. Torquemada illustrates this with the story of a group of Indian chieftains who arrived at Tenochtitlán one day, and asked for an audience with Moctezuma. This was granted for the next day, but at sunset it was discovered that there were no flowers available, worthy of presenting to the king. Immediately they hunted up a youth famed for his speed as a runner, and dispatched him to Cuernavaca about 50 miles away. This town, which in the 15th century paid a daily tribute of flowers to the King of Texcoco, is still one of Mexico's garden cities, famous for its year-round flowers. The runner reached Cuernavaca at midnight, picked up the flowers and the next morning was back in Mexico City with the desired offering.

Having mentioned Cuernavaca, it is interesting to note that reports of the gardens near Quauhnahuac (Cuernavaca) are included in the work of Díaz del Castillo. (Later accounts of a famous garden in Cuernavaca in the 16th century, which belonged to some one by the name of Díaz, suggest that perhaps in helping to "liberate" the Mexicans from Moctezuma, Díaz liberated these gardens for himself.)

Torquemada, too, described the gardens at Huaxtepec.

> "The garden measured two leagues in circumference. In the middle of it ran a river, its banks shaded by many groves of trees. Here and there were resting places with gardens of many different kinds of flowers and fruits. There were buildings, seed beds, fountains and, scattered among the rocky cliffs which were decorated with carvings, were arbors, chapels, look-outs and stairways cut into the very rock."

As mentioned earlier, the descriptions we have of the early Mexican gardens are often so superficial and inadequate that it is difficult to make up even a partial list of the plants that flourished in them. One such list, for Huaxtepec, was prepared in the 1920's by Zelia Nuttall, the American anthropologist. It included Persea or "aguacate", the avocado; Crataegus or "tejocote", the hawthorn; *Prunus capulin*, the Mexican cherry; various members of the Sapotaceae *Moctezuma speciosissima*, of the Bombacaceae; Ceiba or "pochote", the silk cotton tree; Poinsettia; Cleome; Acacia; Yucca; Tigridia or "oceloxóchitl"; Tagetes or "cempalxóchitl", the marigold; Zinnia; Hibiscus; Psidium or "xalxocotl", the guava; Spondias; as well as many species of ferns, palms, orchids and cacti. One is tempted to accept Mrs. Nuttall's list with some assurance since it contains plants that continue to be used in Mexico today as ornamentals and medicinal plants.

THE GARDENS OF NETZAHUALCOYOTL

Almost as famous as the gardens of Moctezuma and his brother were those of the King of Texcoco, Netzahualcóyotl, and for the first reference to these, we return to Motolinia.

"Especially notable", he says, "was the house of the principal lord; both the old house with its garden surrounded by over a thousand large and beautiful cedars, most of which are still standing, although the house has been razed; and the other house, in which a whole army could be lodged, with many gardens and a very large pool which was entered in boats through an underground passage." Motolinia's work was used frequently by other writers on the history of Mexico, among them Francisco López de Gomara, chaplain to Córtes after his return to Spain, and his official historian, who wrote the *Historia General de las Indias* in 1552. Most of his information came, of course, from Córtes but the material on gardens seems to have been copied from Motolinia, and this, in turn, formed the basis of later references by the "cronista mayor de su magestad," Antonio Herrera y Tordesilla, who published his *Historia General de los Hechos de los Castellanos* in 1601.

Two works by descendants of the Aztec rulers supply us with additional details of the gardens of Netzahualcóytol. One called *Relación de Texcoco* was written in 1583 by his grandson, Juan Bautista Pomar, and contains the following description of one of the gardens:

> "There is no principal and abundant source of water in this city . . . It was necessary to unite into one the many springs at their sources, . . . channeling them into canals. This was done by Netzahualcóyotl and Netzahualpitzintzli, not so much to provide drinking water . . . as to provide water to irrigate the orchards and gardens . . . Not only did they raise the flowers that grow naturally in this area, but they also had others from the more temperate regions and the tropics, all of which they cared for with much effort."

According to Dr. Maldonado, the exact location of this garden is not known, except that it was about 12 leagues (30 miles) from Texcoco.

The second work is the important *Historia Chichimeca* of Fernando de Alva Ixtlilxóchitl, written early in the 1600's. Here we read of the many wonders of the gardens: elaborate buildings, irrigation canals, reservoirs, baths, stairways, terraces; of how aqueducts brought water to fountains from which a spray fell like gentle rain over the plants in the garden; of how the job of caring for the extensive gardens was assigned to different tribes as their tribute to the sovereign, each charged with definite duties in certain parts of the gardens. Perhaps, as Susan Hale says, Ixtlilxóchitl "cast over his picture of the Golden Age of Texcoco a glow which is hardly justified by the cold light of modern research", and perhaps his story is now "regarded as unreliable in many particulars". On the other hand, other authors talk of Netzahualcóyotl, the poet king, as a wise, enlightened and cultured sovereign who, during his long reign (1403-1474), made of Texcoco the "Athens of America."

Ixtlilxóchitl lists eight gardens that belonged to Netzahualcóyotl and singles out one at Tzinanostic (also written Tzinacostoc and Tzinaconoztoc) as his grandfather's favorite. Mendizabal cites still another at Chichuhnoyacán, which was supposed to have been the favorite of Netzahualcóyotl's father. The most famous of the gardens in the kingdom of Texcoco was, however, without a doubt the one at Tetzcotzingo, on the slopes and sum-

Bald Cypress (Ahuehuete) at Santa Maria del Tule.

mit of a hill near a spot now known as the Molino de las Flores. According to Fray Agustín Dávila Padilla, as quoted by Mendizabal, "The entire hill was planted with beautiful groves of trees and lovely orchards, with many jasmin plants and other scented flowers." One may wonder, in passing, why the Royal Gardens in Mexico were so often placed on the summits and slopes of hills. Perhaps it was because they were connected in some way with religious ceremonies. The kings were also priests, it must not be forgotten, and hill tops made ideal sites for astronomical observations and for conducting impressive rituals.

AFTER THE CONQUEST

What has happened to all these gardens in the years since the Conquest? We have the answer in the reports of travellers who continue to visit México and describe the things they saw. One of the earliest to visit México after the War of Independence was W. Bullock who, after a trip to Mexico, in 1823, wrote his *Six Months Residence and Travels in Mexico.* In this he described the aqueduct at Tetzcotzingo and the old cypresses in the old palace of Netzahualcóyotl, as well as many aspects of the plant life that attracted him in his travels.

In 1853, Brantz Mayer, of the U.S. diplomatic corps in México, wrote a scholarly detailed historical study of Mexico. In volume 2 of this work, he describes at great length the resources of México, and the things that interest visitors to that country. Among the latter, he cites particularly the ruins near the summit of Tetzcotzingo, 3 miles west of Texcoco, and the aqueduct that brought water to the gardens of Netzahualcóyotl. He describes also the Bosque del Contador, northwest of Texcoco as:

> "An ancient grove of double rows of gigantic cypresses, 500 in number, arranged in a square corresponding to the points of the compass and enclosing an area of nearly 10 acres. At the northwest point of this quadrangle, another double row of lordly cypresses runs westward toward a dyke north of which there is a deeply oblong tank, neatly walled and filled with water. From the soft spongy character of the soil in the center of the great quadrangular grove, it is supposed that the vast area was once occupied by a lake. Along the raised banks and beneath the shadow of the double line of majestic trees were the walks and arbors in which Netzahualcóyotl and his courtiers amused themselves."

In 1861, Edward Burnett Tylor in his *Anahuac*, described the gardens at Tetzcotzingo as follows: "The hill itself was overgrown with brushwood, aloes (agave, probably), prickly pear, but numerous roads and flights of steps cut in the rock were distinguishable." He, too, mentions going to the Bosque del Contador, near Texcoco, where there was a "grand square looking toward the cardinal points and composed of ahuehuetes, grand old deciduous cypresses, many of them 40 feet round and older than the discovery of America." One finds similar references in Susan Hale's *Mexico.*

"A magnificent grove of lofty ahuehuetes at some distance from the central part of the grounds surrounds a large quadrangle now dry, which was probably an artificial lake in the time of the great king." At Texcoco "are left remains of terraced walls, and stairways wind around the hill from the bottom to the top. The country

all about is full of artificial embankments, reservoirs, and aqueducts for leading water and developing the attractions of the place." Miss Hale wrote also of her visit to Chapultepec: "There is now standing an ancient cypress or ahuehuete, huge among the other great trees of the grove, which goes by the name of Montezuma's cypress. Its gnarled trunk must measure more than 100 feet across and its branches themselves are as big as trees."

In October, 1941, Cora Oneal, writing in the *Bulletin of the Pan American Union*, gives her impressions of the gardens at Texcotzingo; "The gardens of this royal retreat were planted in terraces, and even now, after centuries of decay, some of the steps leading to them remain in good condition. Extremely well preserved nearby is a large bathing pool with a stone seat and small fountain, all carved from native porphyry." It is interesting to note Mrs. Oneal's use of the term "large". An earlier writer describing the same bath wrote: "It might have been his foot bath, if you will, but it would have been an impossibility for any monarch, of larger dimensions than Oberon, to take a duck in it."

As for Huaxtepec, we have the description written in 1930 by Enrique Juan Palacios, when he visited the area to study the archaeological remains found there. Of all the exciting list of plants brought there at the orders of Moctezuma, there remains not one. Only the imposing grove of ahuehuetes has survived. Approaching this "bosque", says Palacios, "the terrain becomes rough and broken, covered with vegetation. Heavy matted thickets alternate with clumps of trees, mangroves (?), willows and figs . . . innumerable springs, clear "ojos de agua" bubble continuously at the foot of the majestic cypresses. In spots they gush forth, it seems, from the very roots of the bananas and other trees that flourish on the site". He recalls the words cited by Durán, "I hear that it is fertile and plentiful land, with abundant water and springs. Especially famous are the springs in Hauxtepec where, for your relaxation and recreation and for your descendants, it would be delightful to have a large basin or reservoir where all this water could be gathered as high as it could rise, to irrigate all the land that it could reach". Palacios comments also on the enormous fig trees that he sees, and speculates that these could well have been the source of the paper which the inhabitants of nearby Tepoztlán prepared from the bark of these trees and sent as tribute to the Aztec capital.

How shall we evaluate these gardens today? How much reliance can we place on the various descriptions and reports of these gardens that have come down to us? To answer the last question first, perhaps we might select the following kinds of reports as the most dependable and trustworthy: first, the accounts of the conquistadores, themselves, Córtes, Díaz del Castillo; then the accounts of the monks who followed so closely on the heels of the soldiers; then the accounts written by the descendants of the Aztecs living in Mexico at the time of

the Conquest; and, finally, the descriptions of various parts of Mexico, called *Relaciones*, which were mentioned earlier in this article.

On the other hand, many references to the gardens of the ancient Mexicans are second-hand accounts; often based, it is true, on original reports, but so embroidered and decorated with imaginary details that they must be discounted when we try to evaluate the true value of the gardens which the Spaniards found in the land of the Aztecs. Such would be, for example, the *Historia de la Conquista de México*, by Antonio Solís y Rivadeynera. Solís was never in Mexico, had not had any dealings with the Indians, did not know the American scene. What he knew of Mexico he learned from reading. Yet his writing was of such a high literary quality that he had an enormous following and his work went through many editions. The same might be said of Prescott, who made masterly use of all kinds of documents, published and unpublished, to produce a work, that sets a high level of scholarship but reveals, in spots, the author's lack of direct contact with the country of which he was writing.

Finally, can we consider that these early Mexican gardens were truly botanic gardens; C. Stuart Gager, in Bailey's *Standard Cyclopedia of Horticulture*, defined a botanical garden as follows: "A collection of growing plants, both native and exotic, the primary purpose of which is the advancement and diffusion of botanical knowledge, as distinguished from agriculture and horticulture." Is this not faintly reminiscent of the tradition against raising purely food plants in the royal Mexican gardens? Gager points out, too, that although botanical gardens are used today in many ways — for the identification and classification of plants, for the investigation of plant morphology and physiology, for teaching, and for general plant research, they were developed originally out of an interest in plants that could be used medicinally. Modern botanical gardens, he recalls, were derived directly from the private gardens of the herbalists who were primarily interested in medicinal plants; and these gardens were, in their turn, outgrowths of the herb gardens in the monasteries of the Middle Ages.

Certainly the early Mexican gardens meet a number of the criteria set up in the Gager definition. They were collections of plants, both native and exotic. Their major purposes were the cultivation of medicinal and ornamental plants. Furthermore, it might be pointed out that a study of botanical knowledge among the Aztecs, like the one carried out by Paso y Troncoso, indicates that these early Mexicans had even evolved a kind of system of plant classification that is not too far removed from the taxonomy of their European contemporaries. It does not therefore seem at all far-fetched to consider that the places where these plants were being grown and studied could have been what we might call today botanical gardens, or, perhaps better, arboreta, since the emphasis was on woody plants. Today, we must hunt for the fragmentary remains of these once magnificent establishments. What a pity that no attempt was made to

preserve these gardens for posterity! As one views some of the results of the conquest of the Aztecs by the Spaniards — the destruction of the superb monuments and temples, the burning of the priceless picture-manuscripts, the neglect of the botanical gardens, one is forced to wonder where to draw the line between the civilized nation and the barbarian.

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A FEW LINES ABOUT AN ORCHID PLANT

Last year I was given a blooming orchid plant. After the blossoms had faded, I put it in my small greenhouse where I grow zonal geraniums, thinking that if it lived, all right, and if it died I would not worry. I have been trying to simplify my greenhouse operation by growing nothing but geraniums, so I placed the plant in a corner of one of the benches and left it to its fate. I did not even hang it up in the light and air as I had intended doing.

The orchid plant has been on the bench in the midst of blooming geraniums for a year. It has not been fertilized and has been watered as geraniums are watered, — every day, water being poured into the pots with practically no overhead sprinkling. As I do not do the watering myself, occasionally when working on my geraniums I remembered to sprinkle it lightly, but during summer heat for many days the plant had no water on its foliage. About two weeks ago it started to bloom. I brought it into the house and now it has four beautiful blossoms and a delicious fragrance which I notice every time I enter the room. It is a Brasso-Cattleya, and I am told its fragrance comes from its Brassavola parentage.

So I found that an orchid plant is tougher than I had thought it to be. It can flower and flourish even if not treated according to directions (which say, for instance, that an orchid should be watered only every other day). I shall give it better treatment next year, but of one thing I am certain—it will not flower better than it has done this winter with no care at all. ANNE L. LEHMANN

BALKAN HOLLY (*Ilex aquifolium* var. *angustifolium*)

IN 1934, during a plant-hunting expedition to the Balkan countries of southeastern Europe, Edgar Anderson (then of the Arnold Arboretum) collected seeds and plants of several interesting evergreens, including the Bulgarian Ivy (*Hedera helix* "Bulgaria"), Balkan Yew (*Taxus baccata*), Butcher's Broom (*Ruscus aculeatus*), and the Balkan Holly (*Ilex aquifolium*). All these introductions were grown at the City Garden or the Arboretum at Gray Summit, and now, after twenty years of trial, are turning out to be among the best of their kind for this area. The number of broadleaf evergreens hardy in this part of the Midwest has always been very limited, but it is increasing, and the Balkan Holly is one which will take its place.

The ordinary English Christmas Holly (*Ilex aquifolium*), indigenous to western Europe, is not reliable in our area, even during normal winters. Plants sometimes do pull through a series of mild winters only to be killed outright or damaged severely in ordinary years. Efforts to find hardy forms of it have proved fruitless. But, fortunately, several climatic forms of *Ilex aquifolium* do exist in Europe, including the form native to the Balkan Peninsula.

The Balkan Holly occurs in the Balkan mountains in southeastern Europe where the climatic patterns closely simulate those in parts of our own Midwest. Plants grown from the original introduction of twenty years ago, although of slow growth, have survived the many rigors of winter and summer over this period. Temperatures of 10° below zero and a high of 115° above have not inhibited the growth of this holly in the Garden. From the original introduction, we have three plants, one a male, another a female, and a third plant of unknown sex which was repeatedly frozen back at the Arboretum during a couple of 20° below-zero winters before being brought into the City. This year our male and female plants flowered together for the first time, and the female plant, now about eight feet tall, has this autumn turned up with a few bright red berries, very reminiscent of those on ordinary English holly. The Balkan Holly looks like the English Christmas Holly with evergreen leaves and bright red berries, except that the leaves of the Balkan variety lack the lustre of its more comely English cousin.

Further testing will, we hope, completely substantiate our views regarding the virtuous qualities of this evergreen holly for our area.

The severe freeze of last March 26, did not faze the Balkan hollies in the Garden. Early or late freezes affecting tender growth plus warm-ups and bright sun in mid-winter generally do the most damage to broadleaf evergreens in the St. Louis area. Climatic patterns, especially the timing of warm and cold weather, are of greater importance in relation to hardiness than the absolute minimum or maximum temperature. F. G. MEYER

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (April to November) and until six (November to April) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

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COVER: Trail between massive sandstone bluffs at Giant City State Park, Illinois. For this and other photographs we are indebted to J. W. Voigt, Department of Botany, Southern Illinois University, Carbondale, and the Illinois Division of Parks and Memorials, Springfield.

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Missouri Botanical Garden Bulletin

Vol. XLIV MARCH, 1956 No. 3

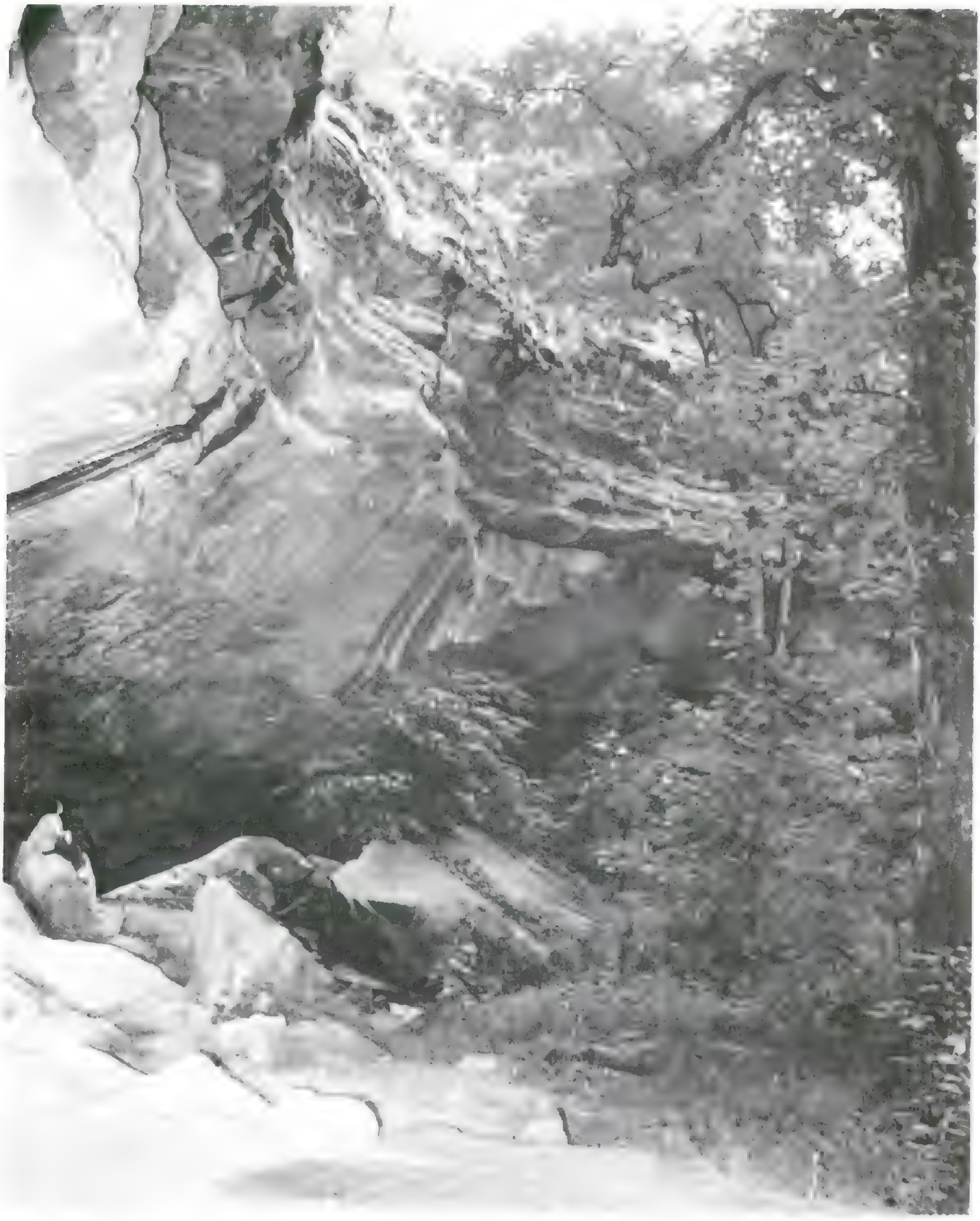
GIANT CITY STATE PARK IN THE SPRING

ROBERT H. MOHLENBROCK

ALONG about the fourth week in April or the first week in May, the flora of low woodlands in southern Illinois reaches its glorious peak. While the drier oak-hickory forests are just awakening from their winter dormancy with blossoms of the Spiderwort (*Tradescantia virginiana*) and Hound's Tongue (*Cynoglossum virginianum*) and while the arid sandstone bluff tops of the Shawneetown Ridge show only the opening leaf buds of the Black Jack and Post Oaks (*Quercus marilandica* and *Q. stellata*) and Winged Elm (*Ulmus alata*) and the flowers of Yellow Star-grass (*Hypoxis hirsuta*) and False Garlic (*Nothoscordum bivalve*), the moist rich woods of the ravines and valleys have been decking themselves out in their finest spring formals. To capture some of this splendid show of wild flowers, let us take an unhurried walk through such a lush area. As a reminder, let us not pick any of the flowers, for we may want to come back and enjoy the show when it opens again next season.

We are going to walk along part of the "two-mile foot trail" in Giant City State Park. This park lies in the southern part of Jackson County and the northern part of Union County, Illinois, about 110 miles south of St. Louis. We go under an archway formed by massive sandstone bluffs on our right and a large boulder on our left. The boulder, through a long period of weathering and erosion, has broken away from the bluff. During its hundreds of independent years, it has developed on its exposed but shaded portions a carpet of mosses. And from the cracks and crevices of its outer edges is growing a little shrub we know to be Wild Hydrangea (*Hydrangea arborescens*). It is not in flower yet, but we are able to see its clusters of flower buds. After passing the archway, we find ourselves still bounded on our right by the bluff, but to our left is the beginning of the low woods.

The first showy wild flower we see as we look to the left is the yellow Celandine Poppy (*Stylophorum diphyllum*). It is not plentiful, but as we scan the woods occasional glowing patches of yellow stand out. If we walk down a small rocky slope to the valley floor to get a better look at the Poppy, we suddenly find ourselves surrounded by a myriad of white, lavender, and violet blossoms. These turn out to be masses of the very common Spring Beauty (*Claytonia*



Rock Slide along Stonefort Creek, Giant City State Park

virginica), Bloodroot (*Sanguinaria canadensis*), Pepper-root (*Dentaria laciniata*), Missouri Violet (*Viola missouriensis*), Marsh Violet (*Viola papilionacea*), and Woolly Blue Violet (*Viola sororia*).

Now we ascend to the path and on the bluff before us, just out of reach, is a ledge on which grow the drooping-flowered Yellow Dog-tooth Violets. Proceeding toward a grotto on our right, we notice the path has become lined, almost as if planned by man, with a whitish-flowered plant which has leaves that remind us of those of maples. This is the Waterleaf (*Hy-*

drophyllum canadense). We can't resist examining the grotto formed by massive sandstone bluffs on three sides. Back into the extremities of this grotto, a small cave leads into the bluff. Coming from the cave is a stream of cool air which causes the small upright plants on the adjacent cliff to sway calmly back and forth. These plants which have very hairy leaves are as yet not in flower. They belong to a summer-blooming species known as Alum-root (*Heuchera parviflora* var. *rugelii*). At the base of these plants hundreds of tiny and some not so tiny green organisms are plastered up against the cool rocks. These are mosses and their relatives, liverworts. By kneeling and peering under a small overhang of the bluff, we can see one of the larger of these liverworts — a leathery, irregular-shaped plant (*Conocephalum* sp.).

Let us continue along the trail at the base of the bluff. We don't progress far until we come to a large Bitternut Hickory (*Carya cordiformis*) whose base is only about three feet from the path. If we are observant, we notice at the base of the tree an attractive bronze-colored fern. This is the Bronze Grape Fern (*Botrychium dissectum* var. *obliquum*). The forest floor is still covered by Spring Beauties and Violets and a small delicate green fern, the Fragile Fern (*Cystopteris fragilis*). And what is this tiny little black-and-white flower at our feet? It's the Harbinger-of-Spring (*Erigenia bulbosa*)! And a harbinger it is, indeed, for had we come this way the last of February, when everything still seemed sleeping, we could have found this sparkling little plant, often called Salt-and-Pepper, sprinkled throughout protected spots in the woods. Here and there are small white flowers which at a glance appear to be Spring Beauties but closer observation reveals the small three-lobed leaves of the False Rue Anemone (*Isopyrum biternatum*).

The path narrows now, the bluff being our western boundary and the steep slope leading to the valley floor our eastern limit. Growing abundantly on the slope are found two interesting shrubs — the Spice-bush (*Lindera benzoin*) with tiny yellow flowers, and the Bladdernut (*Staphylea trifolia*) with rich creamy flowers. Both these shrubs are also featured later in the season when the Spice-bush presents its aromatic crimson berries and the Bladdernut its curious inflated fruits.

A sharp turn to the right, followed almost immediately by an equally sharp one to the left, brings us to a very productive area of the woods. Here a rivulet flows at right angles to the bluff on our right. Under the bluff, the ground is soggy and densely shaded. It is here that we see an occasional cluster of leaves with a flower stalk arising from the center. This is French's Shooting-star (*Dodecatheon frenchii*), known only in the world from similar darkened areas in a few of the counties of southern Illinois. It was probably from the very spot where we now stand that this little plant became known to science back in 1870.

Let us now leave the path and walk along the rivulet for about twenty

Golden Seal
(*Hydrastis canadensis*)

feet until we come to a large isolated boulder to our left. On and around this boulder is a great variety of spring wild flowers. A patch of hairy heart-shaped leaves lie on the rich leaf mold, and we know that if we carefully lift them and look beneath, we shall see tiny maroon flowers belonging to the Wild Ginger (*Asarum reflexum*). And over here are the Dutchman's-breeches (*Dicentra cucullata*) and the Squirrel Corn (*Dicentra canadensis*). The Dutchman's-breeches are those with the petals pointed and spreading, resembling legs of trousers, while the Squirrel Corn has rounded, "closed" petals. Growing from some of the small crevices in the boulder is a plant we all know as Jack-in-the-Pulpit (*Arisaema triphyllum*). Other plants that attract our attention are the beautiful Yellow Bellwort (*Uvularia grandiflora*), Solomon's-seal (*Smilacina racemosa*), Wild Larkspur (*Delphinium tricorne*), Wild Geranium (*Geranium maculatum*), and Yellow Violet (*Viola eriocarpa*).

We now cross the rivulet and climb the small bank on the other side. We find ourselves in the midst of hundreds of ferns—some large and leathery, others small and more delicate. Among the former are the beautiful Christmas Fern (*Polystichum acrostichoides*) and the Marginal Fern (*Dryopteris marginalis*), while the latter include the Maidenhair Fern (*Adiantum pedatum*) and Fragile Fern (*Cystopteris fragilis*).

While still away from the main path, we walk down the gentle slope toward the large Stonefort Creek. The forest floor is completely covered by vegetation. It is this slope that nature designated for the home of some of the more unusual southern Illinois species. A plant about a foot tall and bearing pale pink flowers is the Pink Valerian

(*Synandra hispidula*)

(*Valeriana pauciflora*). And here are strange-looking plants. At first glance they look like little spikes bearing rather ugly small yellow and brown flowers. But if we look more closely, we are able to discover large leaves lying on the ground which are apparently dying. Although this is spring, the leaves of this species actually are withering. This is the Putty-

root Orchid, and after flowering and fruiting, each plant produces a large, veiny, green leaf in August. This leaf persists throughout the winter but disappears when flowering time comes in the spring.

Yellow Lady's Slipper
(*Cypripedium parviflora*)

If we look about us, we see large drooping white flowers borne from a whorl of three leaflets. This is the grandiose White Trillium (*Trillium gleasoni*). Its smaller maroon-flowered cousin, the Wake Robin (*Trillium recurvatum*), is common here, also.

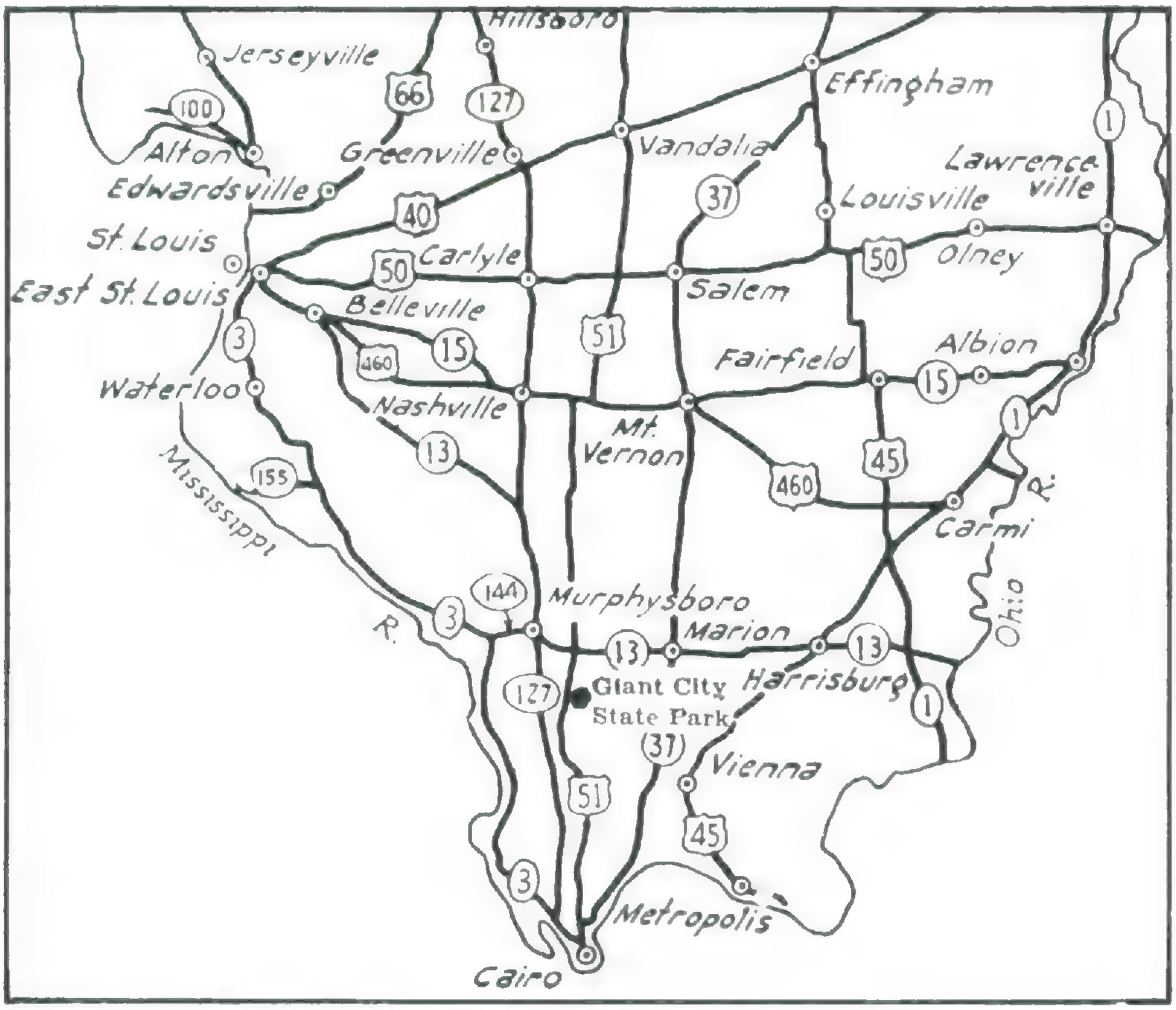
In this area the forest floor is shaded by a number of trees, some of the common ones being the Butternut or White Walnut (*Juglans cinerea*), Hackberry (*Celtis occidentalis*), Sour Gum (*Nyssa sylvatica*) whose leaves turn so crimson in the autumn, Sugar Maple (*Acer saccharum*), and several kinds of Oaks (*Quercus* spp.).

Could we but find the right tree, we would see beneath it, growing on loose sandstone rocks, the curious Walking Fern (*Camptosorus rhizophyllus*). And here are two plants we haven't observed before — one with greenish-yellow flowers, the Blue Cohosh (*Caulophyllum thalictroides*), which later produces blue berries, and a white flowered one, Doll's-eyes (*Actaea alba*), whose glossy white fruits remind one so much of the glassy eyes of a doll.

Where the slope runs into the very bottom of the woods, the ground is misty with pale blue and white blossoms. The plants accounting for this haziness are the White Violet (*Viola striata*) and the two-toned Blue-eyed Mary (*Collinsia verna*). If we are lucky, we may find a few plants of the very rare *Synandra hispidula*. This plant is about fourteen inches tall and bears rich white flowers which may recall the blossoms of the Snapdragon.

So far, we have covered only about one-fourth mile of the foot trail. While

Solomon's Seal
(*Polygonatum canaliculatum*)



Map of southern Illinois showing location of Giant City State Park and some of the various routes by which it may be reached from St. Louis. The quickest is by way of Illinois routes 13 and 51. A more scenic route is via Illinois 3, 144, 13, and 51. This passes through several old German settlements—Columbia, Waterloo, and Redbud—where many of the spick-and-span brick dwellings line the very edge of the sidewalks. Many of these residences feature quaint "old-fashioned" flower beds of mignonette, bleeding-heart, sweet William, and the like. After leaving Chester, the Mississippi River frequently may be seen as it winds its way southward. To the left is probably the most unexplored terrain of southern Illinois—the "Kinkaid Hills", a region of massive sandstone bluffs with numerous moist canyons and occasional waterfalls. Only scattered lonely cabins interrupt the continuity of Mother Nature's handiwork. About 15 miles south of Chester, some 100 yards from the highway, is a small Indian mound, one of the few Indian burial grounds in the southern part of Illinois. After turning onto Route 144, a drive of five miles brings one to the entrance of the new Lake Murphysboro. The water is deep, clear, and well stocked with fish, and the surrounding woodlands are rich in wild flowers. Another pleasant drive is through Missouri on U.S. 61 (not indicated on map), taking the bridge over the Mississippi from Claryville, to Chester, Illinois, and then proceeding to Route 144.

A quiet rocky stream at Giant City State Park.

we have seen many kinds of wild flowers, we would be rewarded further should we continue along the trail, although the number of new wild flowers encountered would become progressively less frequent. Still to be seen are the tiny Bishop's Cap (*Mitella diphylla*) with its petals designed like the most delicate of snowflakes, Wild Phlox (*Phlox divaricata*), Jacob's-ladder (*Polemonium reptans*), and two rare and exciting orchids, the glorious Yellow Lady's-slipper (*Cypripedium parviflorum*) and the mauve and white Showy Orchis (*Orchis spectabilis*) which has the fragrance of the most exotic perfume.

We hope you have enjoyed our little tour. Should you return in the summer or autumn, you would find a great multitude of different species of plants. While the park is relatively small (1523 acres), over 820 species of ferns and flowering plants have been found here. This is approximately one-third the number of species that could be found in the entire state of Illinois.

Should you be interested in further literature dealing with Giant City State Park, two publications in the Illinois Division of Parks and Memorials and State Museum Series are available free at the Giant City lodge. One concerns the geology of the park and is by Carlton Condit. The other, which treats the ferns and flowering plants of the park, was prepared by

Dry sandstone bluffs across from rich moist woods.

the writer. Cabins and camping facilities are available in the park.

To reach the Park from St. Louis, follow Illinois Route 13 from East St. Louis to Carbondale. Then take U.S. Route 51 south about eight miles to the Giant City road which winds for about two miles through beautiful hilly country. Or should you prefer a slightly longer but more scenic journey, follow Illinois Route 3 south to Route 144, then left for 15 miles to Carbondale, and from there south on U.S. 51. The first route is about 105 miles from St. Louis while the latter, which borders the Mississippi for quite a while, covers about 115 miles.

MISSOURI'S CROP OF WILD ANNUALS AND BIENNIALS

JULIAN A. STEYERMARK

THERE is something breath-taking and inspirational in the many forms and colors produced by Nature's parade of flowers, and for many persons the blossoms are the chief or only attraction of a plant. But a true flower-lover wants more than just to see the flower; he wants also to become more intimately acquainted with the earlier stages of growth and leaf-formation preceding flower production. Take, for instance, the wild annuals. In the spring, summer, and fall, they provide masses of striking color on rocky "glades", pastures, meadows, and prairies. In early spring pale blues and lavenders are displayed by the bluets (*Houstonia minima and H. patens*), whites by sandwort, *Arrenaria patula*), Leavenworthia (*Leavenworthia uniflora*), vernal Whitlow grass (*Draba verna*); yellows by Nuttall's stonecrop (*Sedum Nuttallianum*) and selenia (*Selenia aurea*). In the summer and fall centaury (*Centaurium texense*) and palafoxia (*Palafoxia callosa*) impart pink and rosy hues to the landscape, while white is provided by heliotrope (*Heliotropium tenellum*). The mass effect of the colors attracts our attention immediately. After the plant flowers, however, interest in it wanes and few have much interest in what happens next.

Yet, if we happen to be tramping around the limestone "bald knobs" or "glades" of southwestern Missouri in October and November, it may surprise us to learn that what appears to be a bare, drab, rocky soil surface is actually teeming with living plants. Look down closely and you may see infinitesimal bits of gray-green hugging the ground. What are they? They are the tiny young plants of various autumn annuals. Short, thread-like leaves, so characteristic of the adult sandwort (*Arenaria patula*), are already developed and large enough to be seen on the seedlings ready to take the winter. Near by are the young plants of widow's cross (*Sedum pulchellum*) with broad, spoon-shaped, gray-green leaves appearing as tiny flat rosettes.

They, and the clan of annuals to which they belong, signal to us that "spring is just around the corner". They are "all set to go", come winter, and are waiting for the first touch of spring to continue their growth. They are winter annuals that will survive the cold wintry blasts. The seeds they produced in quantity fell to the ground or were scattered by the wind, and lay dormant to "season" for a few months. Following late summer or autumnal rains, the tiny seeds germinated. In the fall-flowering annuals such as *Palafoxia callosa*, the pink-flowered member of the Composite Family found on the limestone "glades" of southwestern Missouri, germination of the seeds is delayed until the following spring. But those which normally flower in the spring germinate their seeds in the fall, and

the young plants remain over the winter in a reduced state of development ready to continue their growth the following spring.

If we look carefully now at the leaf mould covering the ground in the wooded valleys, we may be fortunate enough to see the little seedlings of the blue-eyed Mary (*Collinsia verna*) already showing the adult type of short broad leaves with little notches on their margins, or the young stems of cleavers or bedstraw (*Galium Aparine*) with the broad "seed leaves" followed by light green leaves arranged in tiers, one above the other.

These *annuals* all have *one* feature in common: *they germinate, flower, produce seed, and germinate again, all within the period of one year.* The true *biennials require two years to produce flowers:* During the *first year* a *rosette of leaves* is produced; during the *second year* the *flowers and seeds.* Two good examples of native biennials of Missouri are the rose gentian (*Sabatia angularis*) and Indian paint brush (*Castilleja coccinea*). The first year the rose gentian is only a rosette of two to four pairs of smooth, pale green, rounded leaves closely hugging the surface of the soil. This rosette gives rise during the following summer to a branching leafy stem bearing fragrant pink or white showy flowers. The first year Indian paint brush consists of a rosette of several, narrow, irregularly toothed, yellow-green leaves lying close to the ground. The second year an erect leafy stem rises from this rosette, bearing at its summit a cluster of scarlet or yellow bracts enclosing yellow flowers.

ROSE PINK (*Sabatia angularis*)

NOTES ON SNOWDROPS

P. G. MEYER

Flowers of white, on slender scapes, poised like elfin insects in arrested flight—these are the snowdrops, harbingers of spring and first hardy bulbs to flower. While it was easy to coin the name "Snowdrop" to characterize these flowers, it seems more difficult to call them "Bulbous Violets" as did John Gerarde in his great herbal of 1636.

About a dozen species of the genus Galanthus (the botanical name for Snowdrops) are natives of the Old World, from the Alps to Asia Minor where the greatest concentration of species occurs, in Greece, its islands, and Turkey. But only two are really well known in American gardens. The Alpine Snowdrop (*Galanthus nivalis*) of the Alps has long been cultivated and still is the best known. Its green-tipped variety, var. *scharlokii*, is a bizarre form well worth growing. The Elwes Snowdrop (*Galanthus elwesi*), from Turkey, probably is the second best-known Snowdrop in America.

Snowdrops are bulbous plants in the Amaryllis family, which includes the daffodil, snowflake, onion, and amaryllis. Actually, the structure of the snowdrop flower most closely resembles the daffodil. On the other hand, the flowers of the snowdrop, which hang like crystal pendants at the summit of slender green scapes between the two subtending leaves, could hardly be confused with any other plant in the Amaryllis family. The tallest species are not more than six to eight inches in height. In growth habit snowdrops are gregarious like the narcissus. The Snowflake (Leucojum) is most often confused with the Snowdrop, no doubt on account of the similar common names.

Cultivation.—Snowdrops may easily be grown in St. Louis. They are a delight to have, because no other bulbous plant flowers so early. *Galanthus elwesii* and *G. byzantinus* are the first to come into flower, and the last one of the season is the Alpine Snowdrop (*G. nivalis*). It is possible to have a continuous show of snowdrops from the first of January until almost the middle of March. This year, a few flowers of *Galanthus elwesii* were out in the Mausoleum the first of January.

Snowdrops are woodland plants preferring well-drained soil high in organic matter. They are most effectively planted in masses along a brick-lined walk, at the edge of a shrub border, or in clumps with tree trunks as a bold background. Well-established plantings left undisturbed for years will naturalize freely from seed and bulblets. The most effective snowdrop plantings at the Garden are massive clumps framed against the ivy ground-cover in the Mausoleum. Some of these plantings are at least twenty-five years old. Regarding depth of planting, from two to six inches seems to suit them best. In a warm soil high in organic matter, bulbs planted two inches deep will flower the earliest.

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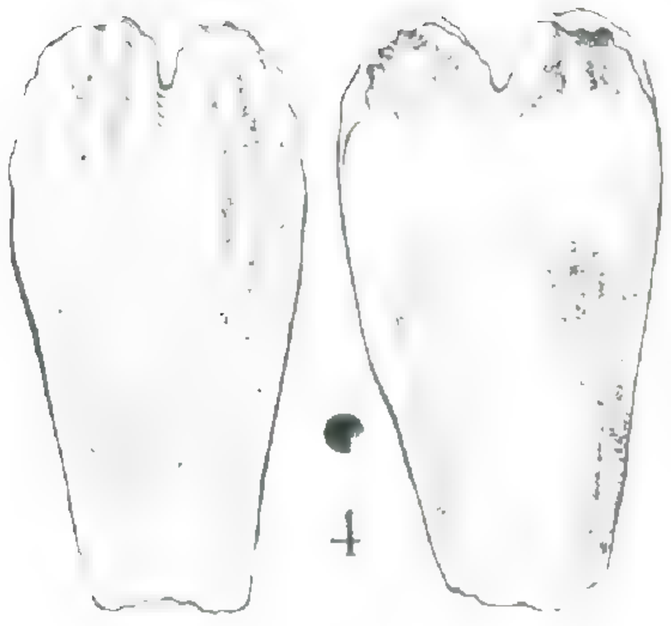

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BYZANTINE SNOWDROP (*Galanthus byzantinus*)

An occasional transplanting may be necessary whenever flowering seems to lag; however, fertilizing snowdrops with bone meal, at the rate of three pounds per hundred square feet, should keep these plants multiplying and flowering profusely over many years.

Transplanting snowdrop bulbs should be done preferably while they are in flower. They just can't stand drying out. Failure is almost always due to dried out bulbs that were dead when bought. Of the two sorts commonly offered by dealers, *Galanthus nivalis* suffers more. Imported Dutch bulbs of *G. elwesii* planted in late October came through nearly 100 per cent. Snowdrops and the closely related Spring Snowflake (*Leucojum vernum*) do not have thick protective bulb coats to prevent desiccation. More of these bulbs would be grown if transplanting in spring was more fully appreciated.

Elwes Snowdrop (*Galanthus elwesii*) is a native of western Turkey and one of the most variable in the genus. A number of garden forms and hybrids of this species have confused specialists for a long time. At least three forms are growing in the Mausoleum. An outstanding form has narrow, blue-green, more or less pleated leaves less than a half-inch wide, and flowers with the outer segments oblong and pointed. When full-blown, the blooms emit a delicate perfume very attractive to bees. The more common garden variety offered by Dutch bulb merchants has wider flat leaves covered by whitish bloom, with the outer flower segments less pointed and more deeply cup-shaped. Normally, a few flowers of this species are in bloom by the first of February. This year a few were out the first of January.

The Byzantine Snowdrop (*Galanthus byzantinus*) is a reputed hybrid which was introduced into cultivation from Turkey at the end of the last century. This is one of the earliest species to flower but is rarely seen in American gardens. The plant illustrated was grown from bulbs sent a few years ago from Dr. H. F. Dovaston at the Agricultural College at Ayr, Scotland. This has long been considered one of the choicest species, and it is hoped our introductions may bear out earlier appraisals.

EXPLANATION OF ILLUSTRATION OF *GALANTHUS BYZANTINUS*

Fig. 1. Stamen. × 2½.
Fig. 2. Habit of plant. Outer three flower segments (sepals) white, inner three segments corona-like, with a patch of green at the base and two spots at notch at summit. About natural size.
Fig. 3. Flower, face view. About natural size.
Fig. 4. Outer and inner view of petals—stippled areas green. × 2½.
Fig. 5. Flower components: stamens and flower segments (sepal and petal) in perspective. About natural size.

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A.M. until seven P.M. (April to November) and until six (November to April) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four. The Garden is nearly a mile long and has several entrances. The main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a.m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

Weeds. by W. C. Muenscher. 560 pages. The Macmillan Co. New York, 1955. Price $10.00.

If your back is sore, your knees stiff and your hands blistered from digging and pulling; if you think weeds are overwhelming you, it's time to stop and look into the new edition of this intriguing book first published twenty years ago. Dr. Muenscher is the country's foremost authority on weeds and his career has been devoted to studying and teaching about these aggressive plants. He writes so much of interest that I am tempted to subtitle the book — How to make Friends with the Weeds. The bulk of the volume concerns the identification and description of some 571 kinds of plants, often objectionable, which occur in the northern United States. What to do about them is not a purpose of this book although references are given to sources of such information as their chemical control. Advice on this topic is alas, mainly, dig, hoe and grub. There are 135 fine illustrations to help in recognition and accounts of their origins, life histories and cunning methods of dispersal supply clues for eradication. Several of the commonest as the Mustards, Docks, and Purslane are edible. Some are medicinal plants as the lovely Foxglove, the Wild Cranesbill, pesky relative of the Geranium, and that plague of the lawn, American Pennyroyal. About the very poisonous Jimson-weed common in barnyards, one wonders who tells the little pigs not to eat it. Many of those included might be welcomed into St. Louis gardens, among them Hay-scented Fern, Cinnamon Fern, Day Lily, Mountain Laurel, Spearmint and Horehound. Perhaps one might select some of these, relax and grow weeds. There is much to be learned about how and why plants are spread. The weeds have much to tell.

ALICE F. TRYON

WHAT MAKES A GARDEN
A TOUR FOR THE BENEFIT OF THE MISSOURI BOTANICAL GARDEN

The Garden Club of St. Louis invites you to visit the following ten outstanding gardens:

The Dates— Friday, April 27
Saturday, April 28
Sunday, April 29
The Hours— 10:30 A.M. to 5:30 P.M.
Admission— $2.00, tax included.
Tickets— On sale at all of the gardens on the tour, at the Missouri Botanical Garden, and by mail. Send check to Mr. William Weld, 9936 Litzsinger Road, St. Louis, 17.

GARDENS TO BE SHOWN ON THE TOUR

1. Mr. and Mrs. Warren Chandler
   6357 Ellenwood Avenue
   A terrace and green garden designed by Peter Seltzer, a wonderful old gentleman who was over eighty years old when he designed and built this garden. The garden accents Italian

ornaments, yew hedges, brick walls, and *privacy* — a peaceful garden, lived in, worked in, and loved by its owners.

2. Mr. and Mrs. Arthur Hoskins
   6416 Cecil Avenue
   Handsome clipped ivy columns on front of this brick Georgian town house. A curving walk leads to enclosed brick and wrought-iron terrace. A flourishing pair of *Magnolia grandiflora* accents the perennial garden. Tool storage and work space in a shuttered area. Display of new and useful tools will be in the Georgian garage.
3. Mr. and Mrs. Meredith Jones
   6419 Ellenwood Avenue
   The brick terraced garden adjoining the house was designed by the late Peter Seltzer, an outstanding garden architect of St. Louis. The outer garden, *new this year*, was designed and planted by Eleanor McClure. Both gardens feature statues by Wheeler Williams; dogwood, azaleas, and rhododendrons.
4. Mr. and Mrs. Ralph Bixby
   8930 Ladue Road
   A hundred-foot lot which was considered worthless has developed into an interesting Spring garden.
5. Mrs. Robert Corley
   13 Upper Ladue Road
   The development of a sloping property, done little by little, has resulted in a particularly successful formal garden, below the house. This, because of its design, is pleasing to the eye both winter and summer. The greenhouse and the potting house, designed by Eloise Polk, are a feature of the formal garden. Adjacent to the open fireplace area will be a display of furnishings for outdoor entertaining.
6. Mr. and Mrs. B. B. Culver, Jr.
   330 N. Warson Road
   The garden area is in three levels — the upper and lower terraces were designed by Edith Mason. An exceptionally fine lawn is surrounded by a brick wall backed by white pines. A meadow bordered by a creek edged with naturalized spring bulbs is one of the many interesting features. Most beautiful planting of flowering trees and shrubs. The studio will house a collection of old prints and garden books on exhibit and for sale.
7. Dr. Ben Charles
   2 Fielding Road
   House and garden open. An 1875 farm house, remodeled by Beverly Nelson, has interesting living-room completely lined with books, many fine antiques including large portrait of Dr. Charles' great grandmother. Hedged formal garden leads to swimming pool off terrace.
8. Mr. and Mrs. Henry Hitchcock
   Woods Mill Road
   Chesterfield, Missouri
   An extensive estate landscaped by Mr. Charles Gillette of Virginia. The grass lawn in front commands an extensive view. The many gardens have not been watered through the drought years. A large circular perennial garden is connected to the terrace by an alley of magnolias. A twelve-foot holly hedge adjoins the garage where there will be an instructive display of garden sprays.
9. Mr. and Mrs. Leicester Faust
   Thornhill Farms
   Chesterfield, Missouri
   An estate overlooking the Missouri River — truly old world and full of charm. Old evergreen plantings—a natural wild flower garden never pastured or planted. Informal perennial flower gardens. Two tropical greenhouses. Famous statues of the "Rising and Setting Sun" by Weinmann on a grass terrace overlooking the river. Orchid plants will be offered for sale. (Barbecue sandwiches and coffee will be on sale here on Saturday, April 28, and Sunday, April 29.)
10. Mr. and Mrs. Warren Shapleigh
    R. R. 13, Mason Road
    A small prefabricated country house surrounded by three gardens. These were built and maintained by the owners. Eight years ago this land was a bare, eroded pasture, devoid of topsoil. Of particular note is the multiflora rose hedge, which surrounds the present pasture.

THE MISSOURI BOTANICAL GARDEN

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A Walking Fern, one of the interesting native plants found growing at Giant City State Park, in southern Illinois, a pleasant place for a day's outing. (See Bob Mohlenbrock's article on pages 33-40 of this BULLETIN.) It is called Walking Fern because the fronds root at the tip, forming eventually an entire little plant with further fronds which reach out and start new plants in turn. A single plant may, in this fashion, form a green mat all over the face of the boulder.

MISSOURI BOTANICAL GARDEN BULLETIN

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Azaleas for St. Louis Gardens

lume XLIV April, 1956 Number 4

COVER: Gable Hybrid Azalea OLD FAITHFUL. These plants have bloomed profusely for ten seasons, normal blooming time being about April 20.

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Missouri Botanical Garden Bulletin

Vol. XLIV APRIL, 1956 No. 4

AZALEAS FOR ST. LOUIS GARDENS

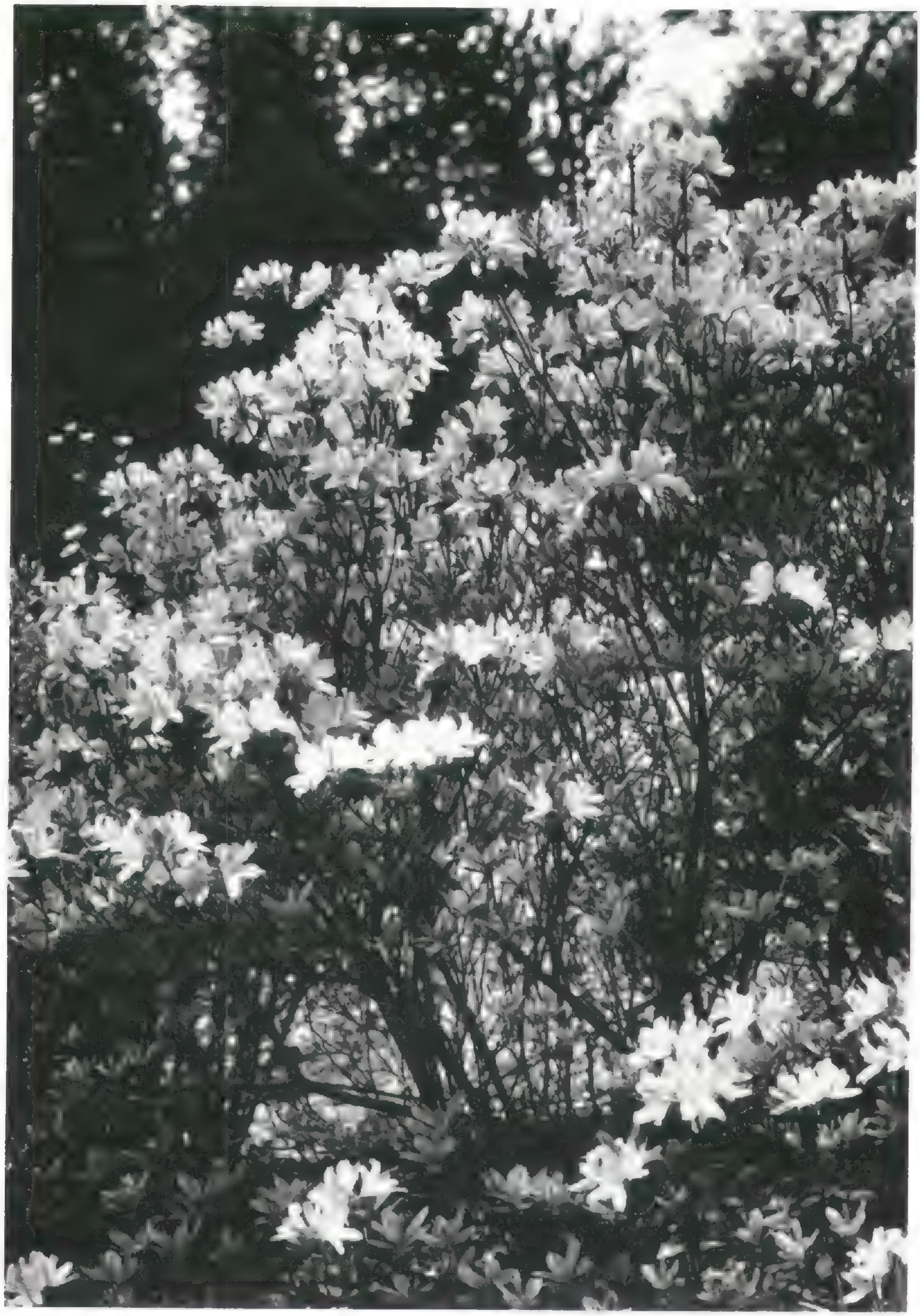
PAUL A. KOHL

OVER twenty years ago, Ernest H. Wilson of the Arnold Arboretum, in his book "If I Were to Make a Garden," devoted a chapter to "The Brilliant Gaiety of Azaleas," and in a still earlier work he included azaleas among the aristocrats of the garden. Azaleas are the true aristocrats for the gardens of the St. Louis area, and, if given a little extra care, can be the most cherished plants in a shrub collection.

In gardening we are entirely dependent upon the changing weather conditions, and very often the St. Louis area is considered one of the most difficult climates in which to garden. We have sudden changes in temperature, dry and wet summers, and late spring freezes; but by comparison with other parts of the country, our climate is not so rigorous as to discourage us from growing some of the choicer plants. We hope we are now emerging from the drought which has gripped this area for a number of years. While counting our plant losses we can't help but wonder what the score is in Florida and the Pacific Northwest after the damaging cold spells, or in the East after the hurricanes and floods and in the West after the floods. At least we are not the only ones who must adapt gardening to a fickle climate, but this adapting is the challenge that tests our abilities and makes gardening such an interesting and rewarding hobby or avocation.

Azaleas are a little more exacting than the average plant in their requirements as to soil, location and moisture and have therefore been considered difficult to grow in this region. We are learning more about them and with the introduction of better varieties are discovering that they are more adaptable to our climate than we realized. There are many, many azaleas, but this article is about the kinds I have grown in the Garden.

For many years, the Garden has used the Indian and Kurume azaleas in its floral displays and in the spring flower shows formerly held in the Arena and Kiel Auditorium. These plants have been grown in large pots, some of them for more than twenty years. This may be considered a good record for this part of the country, but not unusual, for there are instances where



MOLLIS HYBRID AZALEA

The Mollis hybrids may be grown in full sun. The plants are vigorous and the flowers large.

Indian azaleas have been grown in pots in England for more than forty years and the Japanese have very old azaleas trained as Bonsai trees.

While our potted azaleas are watered with city tap water, which contains calcium, they seem to tolerate it if they are grown in soil containing peat and are supplied with nutrients which counteract the accumulation of lime. We have grown azaleas in pure peat and also in sphagnum with excellent results. To keep the plants in good condition we use such materials as cottonseed meal, iron sulphate, ground sulphur, and balanced fertilizers especially prepared for camellias and azaleas. When azalea leaves lose their dark green color we know the plants are in trouble, although we cannot pin-point the cause for the change. The yellowing foliage might be the result of starvation, alkaline soil, or poor drainage. When soil in a pot becomes water-logged, air is excluded and the yellowing leaves are the first symptom of poor drainage. If the drainage is good and an azalea becomes anaemic the cause is probably due to a deficiency of iron and other trace elements, and such a plant is said to be "chlorotic." This does not necessarily mean that there is a shortage of iron in the soil, but it might be in an insoluble form so that plants cannot utilize it. Iron sulphate, used at the rate of from one-half to one ounce to two gallons of water, applied to the roots or sprayed on the foliage, has frequently been used to restore the normal green color to the leaves. A good combination fertilizer for potted azaleas is one teaspoonful of iron sulphate and eight teaspoonsful of a water-soluble fertilizer in one gallon of water.

Iron chlorosis occurs in other plants as well as azaleas. It is a nutritional problem in the citrus groves in central Florida and it is there that great strides have been made in recent years in restoring chlorotic trees through the use of iron chelates (pronounced "keylates"). In 1953 the first iron chelates became commercially available and now they may be had under various trade names such as Edco iron, Azalea Acid Kapco, Sequestrene NaFe, Versen-Ol iron chelate, and Versen-Ol iron chelate on Vermiculite. In the last two years, whenever we fed our potted azaleas, we added 12 per cent chelated iron to the fertilizer at the rate of one-fourth teaspoonful (1 gram) per gallon of water. We have used this new material cautiously on our potted azaleas, but from our experience thus far we feel that we can safely use it on all azaleas and in stronger amounts. The suggested rate of application of Versen-Ol for a 2- to 4-foot azalea in the garden is ½ to 1 ounce in 2 to 4 gallons of water, applied as a soil drench in the root area of the plant. To correct severe chlorosis on alkaline soils, two to three applications may be necessary at six- to eight-week intervals.

Aluminum sulphate has been used to acidify soils, but its continual use may produce aluminum toxicity in plants. Powdered sulphur is much safer and can be used at the rate of 1 pound to 100 square feet per application on light soils and 2 to 3 pounds on heavier soils. Regardless of which

THE KOREAN RHODODENDRON (*Rhododendron mucronulatum*)
THE EARLIEST-FLOWERING RHODODENDRON.

inorganic chemicals are used to increase acidity, it will not be possible to grow good azaleas unless the soil is well supplied with organic matter.

Much is still to be learned about the acidity of the soil in relation to the growth of azaleas and rhododendrons. Many gardeners have probably been discouraged from growing them because of the emphasis placed on the need for acid soil. This is the cultural point which is the most frequently stressed, as if it were the only matter to consider, whereas location, light and shade, moisture, organic content of the soil, and the selection of suitable kinds of azaleas are just as important as the acidity of the soil. In this connection it is interesting to refer to an article in the 1956 *Rhododendron and Camellia Year Book* of the Royal Horticultural Society. Lanning Roper describes the Kurume Punch Bowl in the Great Park at Windsor, a project initiated in 1946 and completed in 1950, with the planting of over 50,000 Kurume azaleas. The following quotation describes the soil, but nowhere in the article is acidity or the pH of the soil mentioned:

> "In the beginning there was some fear of erosion. The soil was sandy, but it had been improved by a great deal of natural forest leaf-mould which had accumulated on the site through the years, coupled with vast quantities of leaf and peat which were dug in as the land was trenched."

It is not intended to dismiss the subject of acidity, but to consider it in its proper relation with the other cultural practices in growing azaleas. A small testing kit can be used to determine the acidity or alkalinity of the soil, or soil samples can be sent to state experiment stations or soil-testing laboratories for analysis and recommendations. The neutral point on the "pH scale" is 7.0, and a degree or two below this point is the range of acidity azaleas prefer. The domestic and imported peats have a strong acid reaction of about pH 4.5, and if a good amount of peat is added to the soil one can be reasonably sure that the degree of acidity will be low enough for azaleas. The addition of sulphur or any other acidifying agent to the soil will reduce the pH, but a fairly accurate reading cannot be obtained until months after the application.

LOCATION: While most of the deciduous azaleas may be grown in full sun, the evergreen and semi-evergreen kinds prefer light shade part of the day. Shade cast by trees or buildings during the hottest part of the day will also prolong the blooming period. Not every garden has a suitable location for azaleas, although by studying the site it is usually possible to create a sheltered spot with hedges, fences, shrubs, or evergreens. High shade cast by trees is preferred, and if the trees are oaks there will be no surface roots to rob the azaleas of food and moisture.

PLANTING TIME: Azaleas may be purchased in various sizes as potted or balled and burlapped plants. Since in this area azaleas normally bloom in late April and early May, planting time is in March and early April and again in September and October. Potted plants may be set out at any time except during the first flush of growth.

THE PINXTERBLOOM (*Rhododendron nudiflorum*)

The small, usually white flowers are borne in great profusion. *Rhododendron roseum* has deeper-colored, fragrant flowers.

Always moisten the root ball before planting, by standing it in a tub of water for a few minutes and then setting it aside to drain.

SPACING: When a small azalea is planted it is difficult to visualize its height ten years hence, therefore, the tendency is to space plants close together. Four or five feet apart is advisable for most kinds. Generally, the spread of azaleas will be about the same as the ultimate height given in the catalogs. Plants that are placed two or three feet apart for immediate effect may be thinned when they begin to crowd, but the thinning must not be delayed too long.

SOIL: A well-drained, fibrous and spongy soil is the type azaleas prefer. In creating such soil our aim is to duplicate woodland conditions in which the yearly growth cycle provides a continual supply of decaying leaves. We would be fortunate if we had partially decayed oak leaves to mix with the soil, but since this seldom is the case, our best substitute is commercial peat. At times this is very dry when delivered and needs to be moistened by exposing the opened bale or bag to rain, or wetting it with the hose and turning it with a rake until it is uniformly moist. Canadian peat can be conditioned faster than German peat, but the latter is a little more acid.

Azaleas are shallow-rooted plants and in a well-drained location only the top 12-18 inches of soil need be prepared. If sufficient organic matter is available it is well to prepare an entire bed, but when azaleas are interplanted with other shrubs or evergreens, individual holes will suffice. Soil removed from a hole 2 feet in diameter and 1 foot deep equals approximately 3 bushels. By mixing from 1 to 1½ bushels of peat with the soil we have approximately a 50 per cent soil-peat mixture. At that rate a 6-cubic-foot bale of peat will be sufficient for four azaleas, and if the diameter of the hole is increased to 3 feet, one bale will be needed for every two plants. If good leaf mold or old manure is available either one or both could be used to replace half of the peat. As the soil and peat are being mixed, add a cupful each of sulphur and super-phosphate; and if the soil is inclined to be stiff, add about a bucketful of sand per plant.

While the hole is open, loosen the subsoil and mix in peat, leaves, or old manure. Firm the soil as it is returned to the hole so that when an azalea is planted the soil ball will be a little higher than the level of the surrounding area. This allows for settling of the spongy soil and also for the addition of an annual mulch. A slight depression should be left around the plant for water which will help settle the soil. The application of a mulch, about three inches thick, is the final step of the planting operation. A mulch retains moisture, discourages weeds, keeps the roots cool, and prevents rapid changes in temperature in winter. Oak leaves, if available, are preferred but other materials can be used such as peat, ground corn cobs, spent hops, tobacco stems, oak tow, sawdust and wood chips. It is advisable to mix peat with other mulching materials,

Mollis hybrid azaleas may be had in varying shades of salmon, yellow, orange, and rose colors.

for when used alone it sheds water when it becomes dry. A combination of oak leaves and peat, topped with a dressing of wood chips, would make a satisfactory mulch. The annual mulch is easily renewed each year in autumn when leaves are so plentiful.

WATERING: When watering azaleas during dry periods the use of a perforated plastic sprinkler will insure deep penetration without run-off or interference from the wind. On very hot days the plants will benefit by a syringing with the hose, morning and evening, to increase the humidity about the plants.

FEEDING: The continual decomposition of a mulch will supply food for the azaleas, and this may be supplemented with acid fertilizers formulated for camellias, azaleas, and rhododendrons. Such fertilizers may be mixed with an equal amount of cottonseed meal and spread around the plants in February and March and again in June, if necessary. The vigor of the plants is the best indicator of the amount and frequency of the applications. Apply 3 to 4 pounds per 100 square feet of bed space and ¼ to 1 pound per plant, in keeping with the size.

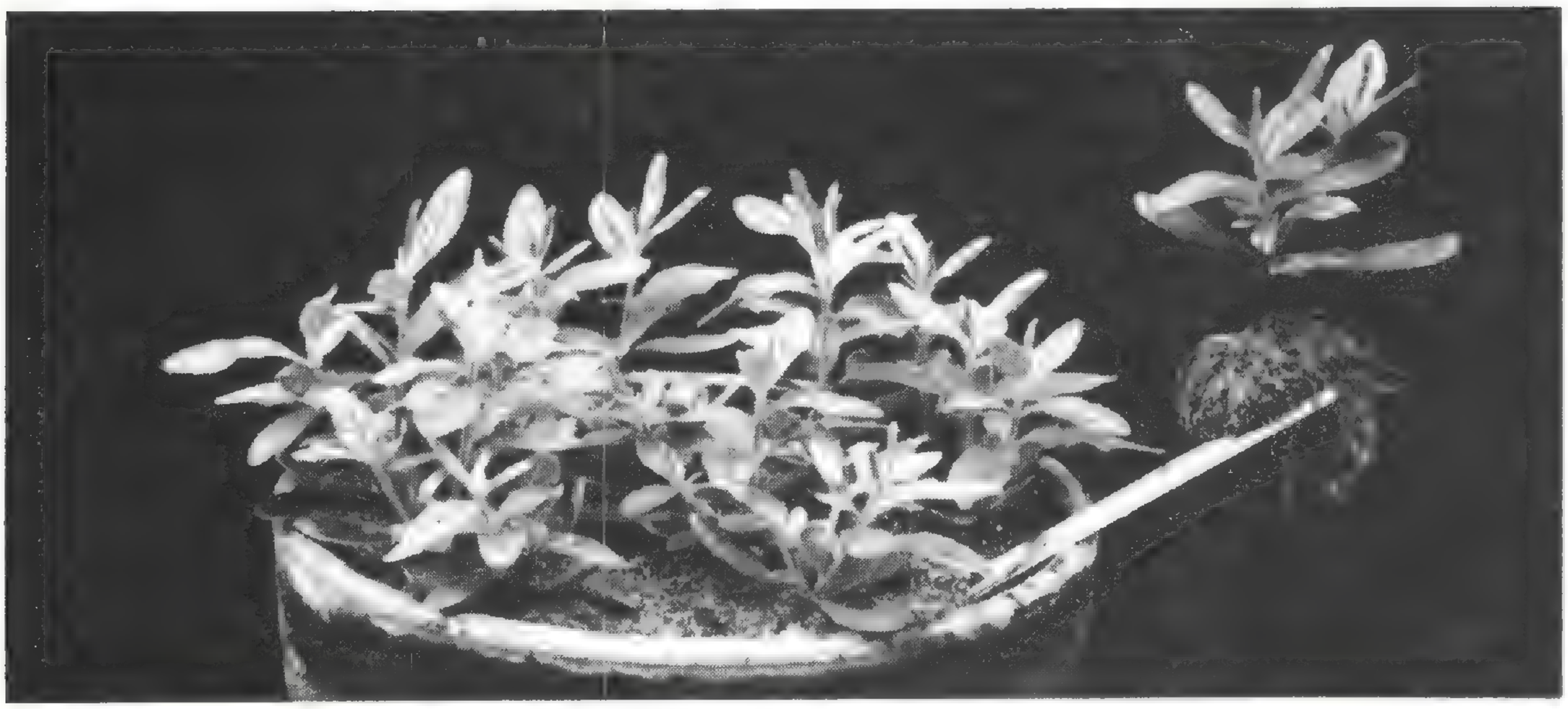
PRUNING: Compared with other plants in the garden, azaleas require very little attention. In the first ten years they seldom need any pruning except for the shortening of a few vigorous canes. Azaleas grow taller and broader each year, in a definite pattern, as new sets of branches develop at the base of the flowers. After ten or more years it will be noticed that the canes of some types of azaleas, like the Mollis, are an inch or more in diameter and that they do not produce flowers as freely as they once did. If one or two of such heavy canes are removed each year, by cutting them back almost to the ground, in a few years the entire plant can be rejuvenated. The new canes will be vigorous and will flower as freely as when the plants were young.

PESTS: The lace bug is a sucking insect that feeds on the underside of the leaves of azaleas and rhododendrons and also attacks chrysanthemums, perennial asters, and other garden plants. These insects have appeared some years on our potted azaleas, but so far have never been observed on any of the plants growing in the garden. Strange as it may seem, we can say that we have never had to spray our azaleas either for insect or fungous attacks. If lace bugs should appear, control them with sprays of nicotine, DDT, lindane, chlordane, or malathion. Spider mites are on the increase, and if they attack azaleas spray them with a miticide, such as Aramite.

Rabbits are fond of young azaleas but let the plants alone when they become woody. Most damage occurs in winter when the rabbits' normal food supply is frozen or covered with snow. People sometimes are unaware that rabbits are in their gardens, but if they find twigs that have been cut on the slant, as if with a knife, the evidence is that this pest is in the neighborhood and might return to do more damage. That being the case, the only possible way of protecting young azaleas is to

Rhododendron obtusum amoenum

An example of hose-in-hose flowers



Rhododendron mucronatum cuttings

These were made in December, rooted in a sand-peat medium in 70° greenhouse temperature. The photograph, made in April, shows cuttings with ample roots for planting in an outdoor frame.

surround the individual plants, or a bed of azaleas, with one-inch mesh wire netting 12 or 18 inches high. Individual cylinders of wire can be slipped over each azalea and held in place with wire or bamboo stakes.

SPECIES AND HYBRIDS: Although botanists group all species of azaleas and rhododendrons in the one big genus, Rhododendron, in horticultural literature and in catalogs they are usually treated separately. For instance, when information about a plant listed as *Azalea ledifolia alba* in catalogs is sought in a plant dictionary, it will be found under *Rhododendron mucronatum* instead of *Azalea ledifolia alba*, which is a synonym.

Like other groups of plants, it is possible to extend the blooming period of azaleas in a garden by selecting the early and late kinds. The first azalea to bloom in April in most years, when forsythia and narcissus are in flower, is *Rhododendron mucronulatum*, the Korean azalea, whose clusters of rosy-purple flowers appear before the leaves. The plant grows tall and narrow, and, according to Wilson, is found in dry and stony situations in its native habitat. Unfortunately, like the early magnolias, the flowers of this azalea are ruined in some years by late frosts.

The next species to flower is *Rhododendron Schlippenbachii* whose common name, the Royal Azalea, is much more pleasing and easily remembered. The slightly pink buds expand into large, white flowers. In the sixteen years that we have had this beautiful azalea its growth has been slow compared to other varieties planted in the same bed.

Rhododendron obtusum amoenum is a small-leaved, semi-evergreen azalea which eventually grows into a large mound as broad as it is tall. The plant is very twiggy and bears a profusion of hose-in-hose, rosy-purple flowers. A "hose-in-hose" flower is one in which there are two perfect corollas, one set

within the other. This azalea is unmindful of dry weather and is one of the easiest to grow. Because of its strong color, it is best planted against an evergreen background or combined with white or pale-pink and lavender azaleas. A striking combination of plants can be created by combining this variety with evergreens and white redbud.

The pinkshell azalea, *Rhododendron Vaseyi*, is a native of the mountains of western North Carolina. In St. Louis it blooms in late April and early May, and since the flowers are a delicate pink it is best planted in light shade.

Our native azalea, *Rhododendron nudiflorum*, the Pinxterbloom, grows to a height of six feet and about May 1st its white or pale-pink flowers appear just as the leaves unfold. *Rhododendron roseum* is similar and is preferred because of its fragrance and deeper-colored flowers.

In 1925 the seed firm of Henry A. Dreer, of Philadelphia, introduced a Kurume azalea named SNOW, which is a hose-in-hose variety, but this is not to be confused with the SNOW AZALEA, *Rhododendron mucronatum*, which has been grown in this country for more than a hundred years. The latter is listed in catalogs under various names — *Azalea indica alba, A. ledifolia alba, A. rosmarinifolia*, and varieties of *mucronatum*. Opinions differ as to where this azalea originated and whether the white form we have is a species or an albino form of a lavender-flowered azalea which Wilson named *Rhododendron mucronatum* var. *ripense*. It is semi-evergreen, with wide-spreading branches which grow horizontally to form a mound six to ten feet wide.

Of the seven azaleas described, three are native American species and the other four are from the Orient. One other hardy azalea that should be included in an azalea collection, is the Flame Azalea, *Rhododendron calendulaceum*. It is from the mountains of Virginia and the Carolinas and is the most colorful of the native American species.

GABLE HYBRID AZALEAS: In the southern Allegheny foothills, at Stewartstown, Pennsylvania, Joseph B. Gable has been hybridizing rhododendrons and azaleas for many years. In 1953 the American Rhododendron Society awarded Mr. Gable its gold medal in recognition of the fine work he is doing in creating hardy azaleas. More than thirty-five named varieties of the Gable azaleas are now commercially available and more are to come. For ten years we have grown two of the Gable varieties of which the first to bloom in late April is OLD FAITHFUL an orchid-pink, single-flowered variety; and a few days later ELIZABETH GABLE, a rose-pink, hose-in-hose, evergreen variety comes into flower. These plants are now four feet tall and equally broad. Until more of the Gable varieties are given a trial the following list of currently popular varieties will serve as a guide in making selections:

BOUDOIR —single, watermelon-pink
CAMEO —double, soft pink
ELIZABETH GABLE —double, rose-pink
ETHELWYN —single, light pink
HERBERT —single, crimson-purple
LOUISE GABLE —double, salmon-pink
PURPLE SPLENDOR —dark purple

ROSEBUD —double, pink
ROSE GREELEY —hose-in-hose, white
SPRINGTIME —single, pink

GLENN DALE HYBRID AZALEAS: In 1950 and 1951 we received a total of 167 clones of azaleas from the Bureau of Plant Industry, Beltsville, Maryland. The plants were small and have been growing in pots until such time as they are large enough for planting out. These plants, sent to us for trial, are a part of the greatest azalea breeding project ever undertaken, instituted in 1929 by Mr. B. Y. Morrison, Principal Horticulturist, Division of Plant Exploration and Introduction of the United States Department of Agriculture, until his retirement in 1951. Many of these clones are now listed in azalea catalogs, and as more information becomes available, it will be possible to select those kinds best suited for a given locality. The following is a suggested list of Glenn Dale varieties, seven of which are in our collection:

ANGELA PLACE —4′, white
ARCTIC —3′, white
BEACON —5′, near scarlet
CRINOLINE —5′, pink
CYGNET —4′, white
DAYSPRING —6′, pink
EROS —3′, pink
FASHION —6′, rose
GLACIER —5′, white
HELEN GUNNING —5′, white, pink margins
MARTHA HITCHCOCK —4′, white, magenta margins
MORNING STAR —6′, rose

Any one wishing to know more about these azaleas will find *Agricultural Monograph No. 20*, "The Glenn Dale Azaleas" by B. Y. Morrison, an interesting booklet. It may be obtained from the Superintendent of Documents, United States Government Printing Office, Washington 25, D.C. The price is 40 cents.

MOLLIS HYBRIDS: The Mollis hybrids originated in Europe about 1880 and have for parents *Rhododendron molle, Rhododendron japonicum* and Ghent hybrids (which in turn are the product of some seven American species), and *Rhododendron flavum* from eastern Europe. The Mollis hybrids are easily grown from seed in a variety of colors from the clearest yellow through rose to deep orange-red. The plants grow tall and broad, can be planted in full sun, transplant easily, and tolerate neutral and slightly alkaline soil. They have one minor fault, in that occasionally they emit a slightly unpleasant odor, but this should not deter any one from growing them.

EXBURY HYBRID AZALEAS: The late Lionel de Rothschild of Exbury, England, hybridized many azaleas in his lifetime, and now about fifty of the clones are available in this country. Several of these were mentioned by Mr. Fador Kernin in the January issue of the *Quarterly Bulletin of the American Rhododendron Society* as having withstood fifteen degrees below zero in Shelby, Nebraska, their only protection from the wind being tar-paper tubes, open at the top. If the Exbury hybrids can be grown in Nebraska they certainly are worth a trial here. This spring we will plant BASILISK and PINK DELIGHT at the Garden.

GROWING YOUR OWN AZALEAS: One can derive a great deal of enjoyment and satisfaction by propagating his own azaleas either by seeds or cuttings. Some azaleas produce an abundance of

MOLLIS HYBRID AZALEA SEEDLINGS IN A COLD-FRAME
After two or three years such plants are large enough for planting in their permanent location.

seed which is gathered during the fall and winter months. Much seed is lost when the capsules open and are shaken by the wind, but even after months of exposure to the elements, when the supposedly empty pods are gathered and vigorously shaken in a paper bag, more seed is collected than is needed for an average sowing.

Azalea seed may be sown in February in a greenhouse, or in April if only a cold-frame is available. Sphagnum moss, rubbed through a half-inch mesh wire-screen, is an excellent medium on which to sow the seed. The sphagnum is moistened, placed in a pot or pan, and firmed. The seed is sown evenly and dry sphagnum lightly sifted over it. The pot is then watered from below by standing it in a pan of water, or from above using a fine spray. A pane of glass will prevent drying of the surface and paper will protect the seed from the hot rays of the sun. A greenhouse bench, shaded by a lath screen suspended from the roof, is an ideal location for starting seedlings. Azalea seed germinates in three to four weeks, and after the seedlings are a week or two old they are benefited by a light feeding of liquid fertilizer. When the seedlings have two or three leaves, they may be transplanted to flats of peat and sand, or peat and perlite or styrafoam, where they will remain until transplanted to pots or prepared beds the following spring. During the first winter the seedlings need the protection of a cool greenhouse or a good coldframe. By the third year there will be some flowers and by the fifth year many of the plants will be large enough for planting out in their permanent location.

A hybrid azalea can only be perpetuated vegetatively, and by that is meant that a piece of the plant must be grown on its own roots either by cuttings or layering or by grafting onto some other azalea stock plant. The simplest and quickest of these methods is by cuttings, but it cannot be accomplished as easily as rooting a geranium. The best rooting medium is an equal amount of peat and sand, or peat and vermiculite. The propagator must rely on his knowledge and experience to determine when cuttings

AZALEA SEEDLINGS FOUR MONTHS OLD

For best results, seedlings are transplanted when they have developed three or four true leaves.

have reached the proper degree of firmness for insertion in the rooting medium. This varies with the kind of azalea and the time of the year. Cuttings may be taken when the shoots of the current season have become firm, which usually is about four to six weeks after flowering. When they are gathered they are dropped in water or wrapped in damp paper and prepared for insertion in the rooting medium as soon as possible to avoid wilting. The preparation consists in removing a few basal leaves, dipping the end of the cutting in No. 2 or No. 3 Hormodin powder and dibbling it into the pot or flat of rooting medium. When all cuttings are inserted, they are watered with a sprinkling can and the flat or pot is covered with a tent of polyethylene sheeting, placed in a sheltered and shaded part of the garden or cold-frame, and shielded from the direct rays of the sun. Except for an occasional watering, the cuttings will need no further attention until they are rooted, which will require sixty days or longer, depending upon the kind of azalea, the temperature, and the time of year. When cuttings are rooted they are hardened off before potting by gradually removing the plastic sheeting. Deciduous azaleas are rooted in the spring, but some of the evergreen and semi-evergreen kinds may also be rooted in the fall and as late as December.

Plants may also be started by layers if a plant with pliable canes is available, but the process is slow, requiring at least a year.

SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (April to November) and until six (November to April) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

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Borage

Herbs and Their Uses

Prepared by the *St. Louis Herb Society*

Emily Dingeldein, Virginia Schreiber, Charlotte Osborn, Alice F. Tryon, Catherine Kieffer, Jane P. Blank, Reka N. Fisher, Emilie Schemm, Mary E. Baer, Edith Baron, Meredith Carson, Isabel Adreon, Louise Horwitz

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COVER: Borage, an original drawing by Louise Horwitz.

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Missouri Botanical Garden Bulletin

Vol. XLIV MAY, 1956 No. 5

SALAD BURNET

(Sanguisorba minor)

THERE are three Burnets. Two belong to the Rose family, and the other, "Saxifrage Burnet," to the Carrot. The Salad Burnet is of the Rose family and is the "lesser" Burnet.

Our Burnet of interest is a perennial, putting out new pinnate leaves every year. Its leaves are small, dainty, with a picoted edge. They are borne on slender stems. Both flower and leaf stalk are a deep crimson color. It is neat in habit and ferny in appearance; good for edging the perennial border. The leaves have a pleasant cucumber flavor and should be cut when about 4 inches tall.

It is best to sow the seeds as soon as they ripen in the autumn, or to propagate by division of the roots in the spring. Choose a dry sunny position for the bed, and if the soil is deficient in lime, fork in a little before sowing.

The Salad Burnet is common in dry pastures and by the wayside. It forms much of the pasturage in England and was cultivated in Germany for the same purpose. Its great advantage is that it remains green all winter and provides food for sheep; they are especially fond of it.

In the herb gardens of olden days, Salad Burnet had its place. Gerard says, "'tis pleasant to be eaten in sallade, in which it is thought to make the hart merry and glad."

Oscar of the Waldorf gives us the following recipe for "Fine Herbs Vinegar."

> "Take equal quantities of Tarragon, Burnet, Chervil and Cress, all of which should have been gathered the day before. Fill a wide-mouthed bottle or jar with this, adding also two cloves of garlic and a green pepper. Cover the whole with vinegar, cork the bottle tightly, and place it in a warm temperature for a fortnight. Strain the vinegar through a fine hair sieve, pressing the herbs well. Then filter through paper until quite clear. Pour into bottles and keep tightly corked."

Try Burnet:

As a garnish on meat instead of parsley.

As a garnish on canapes, a single leaf is effective.

As an ingredient in summer salads for its pleasant cucumber flavor.

EMILY DINGELDEIN

GERARDE, 1636

SWEET MARJORAM

(*Origanum majorana* or *Majorana hortensis*)

THE small, dainty erect gray-green plant of Sweet Marjoram does not attract immediate attention in the herb garden, but it is one of our most indispensable plants. The highly aromatic leaves are widely used, both for industrial and for culinary purposes. Growing to a height of about ten inches, the square reddish-brown central stem is covered with tiny branches; the tip of each branch ending in a small knotted ball of shutter-like leaves. Tiny creamy white flowers begin to peep through these shutters in early August, at which time the plant is ready to harvest. Usually two cuttings may be made in a season.

Sweet Marjoram seed are very tiny but may be sowed outdoors as soon as the ground is warm. Germination is good but slow, taking from twelve to twenty-one days. After danger of cutworm is over, the plants should be thinned to about five inches apart. A sunny, well-drained, chalky soil is best. While Sweet Marjoram thrives inside in pots, the leaves lose some of their aromatic quality. The plant is drought-resistant, which is a boon to St. Louis summers. Sweet Marjoram is a perennial but must be treated as an annual in the North.

Marjoram, "joy of the mountains," has been regarded as a symbol of happiness through the ages. Sweet Marjoram comes from Portugal and was introduced in England during the thirteenth century. There are some thirty varieties of Marjoram known in Europe, the three most common being Wild, Pot, and Sweet or Knotted. Sweet Marjoram has the most delicate flavor for culinary use.

Fresh or dried, there is nothing superior to the leaves of Sweet Marjoram for culinary use. Incredibly fragrant, it is an entity in itself, yet enhances the flavor of other herbs used with it, especially thyme. Sweet Marjoram improves almost any recipe using beef—meat loaf, stew, steak, roasts, and meat sauces. Nothing can replace it in turkey or chicken stuffing or in potato soup. The chopped fresh leaves add to the flavor of green peas and tossed salads.

A Good Herb Mixture to Keep on Hand for Seasoning: Equal parts Marjoram and Winter Savory, with half-quantity Basil, Thyme and Tarragon, all rubbed together and kept air-tight.

Home-made Sausage: Mix two pounds of coarsely ground lean pork with one pound of pork fat; work all together with hands, adding salt, red and black pepper, Sweet Marjoram and Thyme. Keep cool.

Pork Tenderloin with Herbs:

2 small pork loins—salted and peppered
1 onion sliced thin
1 cup orange juice
1 tbsp. sugar
Sweet Marjoram, Thyme, Rosemary.

Cook at 325° until tender, basting rather often.

VIRGINIA SCHREIBER

OREGANO

(*Origanum vulgare*)

PRONUNCIATION of the name of this herb and the identification of it have caused much confusion. Some authority may be found for each of these pronunciations: O-*rig*-an-o, O-*reg*-an-o, O-ri-*gan*-o. Identification has been much more difficult. It has been said that the plant which established itself in our country as a hardy perennial is a kind of Wild Marjoram; which kind no one seems willing to say. Our Wild Marjoram is said to lack the flavor and the aroma of the imported herb; the latter may be grown here. What Parkinson had to say centuries ago may still be said, "There is so much controversy among the moderne writers about the two herbs, sweet and wild. The rest are all mussed up in gardens, their natural places not being known".

In the past plant names have varied from time to time and from place to place. For example, once the names for Wild Marjoram and Sweet Marjoram had something in common: *Origanum vulgare, Origanum majorana;* today, they have nothing in common: *Origanum vulgare, Majorana hortensis.* We can see how the names Oregano and Marjoram came into common use.

To enjoy Oregano to the fullest, buy some of the imported kind and use it in cooking. This brings out the flavor and aroma, and points up the relationship to Sweet Marjoram. When sprinkled on roasting or broiling meat the resulting fragrance is very like that of Sweet Marjoram; the flavor is similar, too. Then we understand and take delight in the ancient Greek description of Oregano. "Joy of the Mountain."

The American Spice Trade Association of New York (1950) says that Oregano is grown mostly in Italy and Mexico, that it is a seasoning essential to chile-con-carne, excellent when sprinkled in meat sauce for spaghetti, fine for omelet or boiled eggs, beef stew, meat sauces, and a good flavoring for pork dishes. According to *Gourmet Magazine,* Oregano is an "important ingredient in most Italian dishes including pizza, veal scallopini and all the pasta sauces . . . for pork, Mexican chicken, and chili dishes."

Broiled Steak: Before broiling, smooth a few drops of olive oil into each side of steak, brush with melted butter and Oregano (1 tbsp. fresh or 1 tsp. dried). After broiling, dust lightly with freshly ground pepper and garlic salt.

Broiled Beef Tongue: Slice a cooked tongue. Arrange in a shallow pan. Brush with melted butter and Oregano. Broil till brown. Repeat for other side.

Roast Chicken: Halve broilers. Brush with melted butter, sprinkle with Oregano and pepper. To the juice of two lemons, add 1 tbsp. fresh Oregano or 1 tsp. of dried Oregano, and ½ c. of butter, which has been melted and lightly browned. Pour mixture on chicken. Bake at 400 degrees until done. Baste often. Garnish with parsley.

CHARLOTTE OSBORN

A MATTER OF THE MINTS

THE true Mints or Menthas are aggressive even in St. Louis gardens. Many stems are produced just under the surface of the soil which not only spread the plants but adapt them to our searing St. Louis summers. What are the kinds of Mints? This matter furrows the brows of gardeners and botanists alike and a ninth-century writer claimed: "There are as many Mints as there are sparks from Vulcan's furnace." Today we believe that there are about twenty-five species but myriads of sparks because the species interbreed.

I have found ten of the species in St. Louis gardens plus an additional half-dozen varieties. Two of these were introduced by our members. Where several kinds of Mints have flourished for a while the gardens are sparkling with hybrids.

Keys are used to identify plants and are so named because they unlock the identity. Using a simple key is something of a game certainly not more strenuous than Bridge or Scrabble. The following one was prepared from the Mints in St. Louis gardens. For each of the paired letters you make a choice then go on to the next pair until you end with a name.

KEY TO THE MINTS

A. Plants forming creeping mats; leaves less than 3/8" broad ..... Pennyroyal
A. Plant erect; leaves more than 1/2" broad ..... B
  B. Leaves with long stalks about 1/3 the length of the blade C
    C. Flowers clustered at stem tip or just below ..... D
      D. Peppermint-scented; flower clusters spike-like ..... Peppermint
      D. Lemon-scented; flowers in short heads ..... Bergamot or Orange Mint
    C. Flowers clustered among leaves on much of the stem ..... E
      E. Leaves egg- or diamond-shaped ..... F
        F. Leaves with yellow patches .... Goldenapple Mint
        F. Leaves entirely green ..... Field Mint
      E. Leaves lance-shaped ..... Anderson's Mint
(cross of Spearmint & Field Mint)

  B. Leaves without stalks or with short stalks .. .. G
    G. Leaves woolly or velvety .. .. H
      H. Leaves roundish, about as bread as long, woolly I
        I. Leaves entirely green; plants tall ..... Woolly Mint
        I. Leaves variegated; plants small, creeping ..... Pineapple Mint
      H. Leaves 2 or more times longer than broad, velvety ..European Horsemint
    G. Leaves scarcely hairy or with no hair ..... J
      J. Leaves oval to egg-shaped ..... Mrs. Schemm's Kentucky Mint
..(cross of Woolly & Spearmint)
      J. Leaves diamond- to lance-shaped ..... Spearmint
(a crisp-leaved Spearmint is common)

ALICE F. TRYON

TARRAGON

(*Artemisia dracunculus*)

FRENCH Tarragon is a perennial which grows to a height of about two feet. It has aromatic leaves which are long, narrow, and undivided. It blossoms in August. The small yellow-and-black flowers appear in round heads, bouquet type. The roots are runners, long and fibrous. There are two kinds of Tarragon: French and Russian. The French Tarragon has smooth, dark green leaves and fine flavor. It is native to southern Europe. The Russian Tarragon, an annual, has less smooth leaves, is of a fresher green shade, and has a bitter taste. It is a native of Siberia.

French Tarragon rarely, if ever, produces fertile flowers in this country, and thus it is not raised from seed. It is propagated in two ways: first, by root division, done when the spring growth is about two inches high. Lift the entire plant carefully to separate; allow two shoots to each root. Second, cuttings may be struck when new growth on plants is about four inches long. Root in clean, sharp sand. Set out before August or the plants will not survive the winter. A few young plants should be raised each year to keep a supply. The plant must be divided every third year to disentangle the mass of shallow roots.

Tarragon succeeds best in a warm, dry situation. It likes sunshine, with a little shade, and thrives in well-drained, rather poor soil. It needs some protection in the winter. This winter three out of four plants in our garden survived. Last fall we mulched the plants with leaves. This spring we added lime and well-rotted cow manure.

My first crop of green leaves is picked in late June or early July, when my best vinegars are prepared. My second crop, harvested in August when the buds begin to open, is used for drying.

To dry, pick the leaves, remove defective ones, wash, place on a wire mesh to drain. Air must circulate above and below drying herbs. Dry at about 80° temperature for several days. When thoroughly dry, pulverize and bottle tightly. Observe for several days to be sure that no moisture appears to create mold. Fresh Tarragon possesses an essential, volatile oil, chemically identical with anise. This oil is lost in drying the herb.

To some, Tarragon is synonymous with salads, but its use is far more extensive. I use it with egg dishes, chicken, mushrooms, and in cream sauces. I frequently use it in combination with Rosemary, Parsley, and Thyme in a butter sauce for fish. Tarragon vinegar is the only flavoring for tartar sauce. French cooks usually mix their mustard with Tarragon vinegar.

To me, Tarragon is a *must* in my garden. It is attractive and ever so useful. It is quite a favorite with my friends, too. At Christmas time, particularly, I have found that my Tarragon vinegar spreads good cheer.

Tarragon Sauce for Fish:

1 c. milk
3 tsp. lemon juice
2 tsp. capers (or nasturtium seed)
3 tsp. flour
½ tsp. Tarragon
1 hard-boiled egg.
Salt and pepper to taste

Stir the flour into ¼ c. of milk until well blended, add the remaining milk. Add Tarragon, capers, lemon juice, salt and pepper. Heat over slow fire, stirring constantly until sauce is proper consistency. Chop the hard-boiled egg and blend with the sauce. Serve with boiled or sauteed fish. Especially good with haddock, cod or halibut.

CATHERINE KIEFFER

Rosemary

MATTHIOLI, 1560

HERB VINEGARS

IT is suggested that pasteurized vinegars be used as the basis. Pasteurization stops the mother-forming bacteria. One may use white or red wine vinegars, cider or other fruit vinegars; malt vinegar prepared from sprouted cereal grains; white or distilled vinegars made by the acetic fermentation of dilute distilled alcohol.

Herb vinegars may be made in many varieties and combinations. The basic vinegar is infused with herbs, seeds, petals of flowers. Seasonings include Basil, Burnet, Borage, Tarragon, Thymes, Marjoram, Chives, Mints, Rose Geranium leaves, rose petals (these in a cider or distilled base), nasturtium flowers.

The time required for infusion of the vinegar varies according as fresh or dried herbs are used. If dried herbs are used, boiling vinegar should be poured over them; let stand ten days. If fresh herbs are used, either they may be placed in cold vinegar, corked and set aside, or the infusion put into a jar, set in a pan of water on the stove till the water boils, then removed, cooled, and corked. Fresh herb vinegar should stand for from two to four weeks. When the vinegar has stood the proper time, strain it through fine muslin or filter papers, and rebottle.

The following should be observed when making vinegars for sale or for competitive judging:

1. Vinegars for sale must be made under sanitary conditions. All herbs used must be thoroughly washed. Bottles must be sterile and new.

2. Criteria with Point Values for Competitive Judging of Vinegars:

Clarity (No foreign matter or cloudiness)	30 points
Flavor and Bouquet (Herbs predominant)	30 points
Packaging (New, sterile bottles)	20 points
Material (Perfect specimen of herb in bottle)	5 points
Presentation (Attractive container, or manner of decorating it)	10 points
Labeling (Label showing herb and vinegar used must be neatly done)	5 points
Total	100 points

Old Creole Recipe for a Spiced Vinegar —Vinaigre Aromatisé:

1 qt. cider vinegar; ⅓ oz. dried mint; ⅓ oz. dried parsley; 1 grated clove of garlic or 1 tsp. juice; 2 small onions; 2 whole cloves; 1 tsp. coarse pepper; corn of grated nutmeg; salt to taste; 1 tbsp. of sugar; 1 tbsp. good brandy. Add the above to vinegar and let stand three weeks. Strain and bottle.

Try a white wine vinegar with Sweet Basil, Lemon Thyme, Rosemary, crushed celery seed, and Lemon peel.

Try your own combinations, but do not have two prima donnas in your production.

JANE P. BLANK

THE SAVORIES (*Satureia hortensis* and *Satureia montana*)

THE Satureias comprise hudreds of varieties, but our concern is with the savories, both summer and winter savory, low-growing, fragrant shrubs native to the Mediterranean area. They greatly resemble plants of Thyme and Nepeta.

Winter Savory (*Satureia montana*) grows about twelve inches high, with woody branches, and small, dark green, shiny leaves. Its many small flowers of white touched with pink do not blossom all at once, but are starred over the plant. It is a hardy perennial which self-sows. Winter Savory is almost evergreen and, planted as a low hedge, keeps the herb garden attractive even in winter. It likes poor, light, well-drained soil. Clipping the shrubs will induce new growth and keep them from becoming spindly.

Summer Savory (*Satureia hortensis*) is similar but is an annual plant. It has reddish, hairy, branching stems, few leaves and pale pinkish-lavender flowers. It grows about eighteeen inches high, and the plants should be grown fairly thick as they tend to be knocked over by wind and storm. The leaves are small, long, narrow and downy—flowers come in midsummer. Seeds may be sown in the open as early as possible, but as they are minute they should be mixed with sand for easier, more open sowing. Summer Savory likes well-drained, moderately rich garden soil and does well in full sun, but it can gratefully use a little shade in the heat of the day.

Both Savories are excellent in the rock garden and for edging. They are used in soups, stuffings, and meat cookery, but Winter Savory has a stronger, ranker taste. Summer Savory is one of the most useful of the sweet herbs and tastes much like Marjoram, but with a more pungent, biting flavor.

Recipes Using Summer Savory:

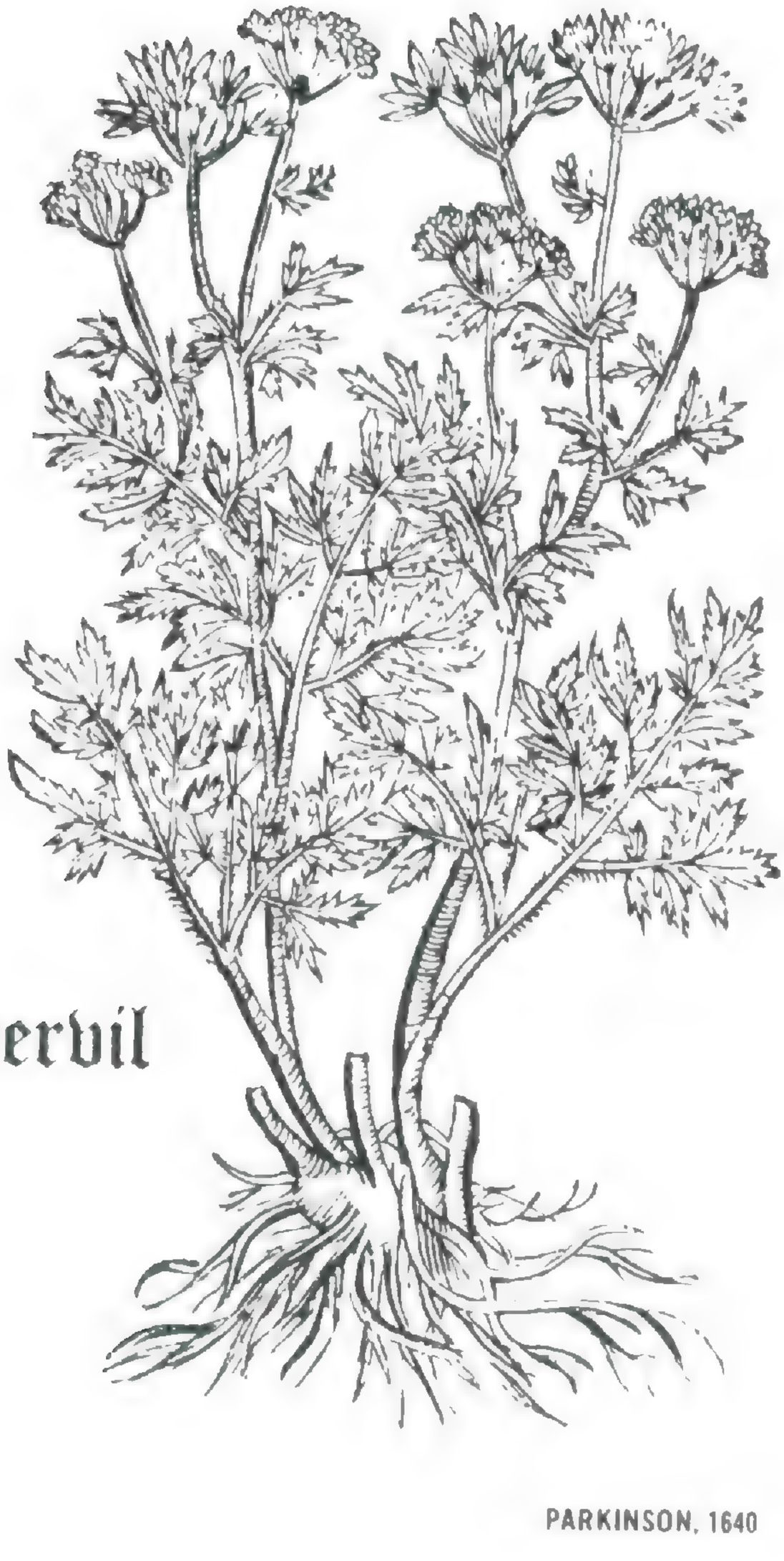
Fried Red Beans—Pour the juice from one can of red kidney beans. Slightly mash the beans, so that the flavors may be absorbed into the body of the bean. Mince an onion and saute till golden brown in one or two tablespoons of bacon grease. Add beans, and ½ teaspoon of Summer Savory and saute till beans become crusty on bottom of the pan. Turn out on a plate, crust side up, and garnish with chopped parsley.

Simple Hot Hors d'Oeuvre — Place a thin slice of small yellow onion on a number of Saltines. Top with a mixture of Hellman's Mayonnaise (only Hellman's seems to work in this recipe) and sour cream to which you have added to taste, Summer Savory and celery seeds. Broil till bubbly.

REKA NEILSON FISHER

Mrs. Jesse Osborn's Punch:

Pour 1 pint boiling water over 4 sprigs each of Apple Mint, Orange Mint, Spearmint. Cover. Steep 15 minutes. Strain. Boil for 5 minutes ½ c. water, 1 c. sugar. Cool. Combine 1 c. pineapple juice, juice of 6 oranges, 2 lemons. Blend all with contents of 1 large bottle of ginger ale. Serve in tall glasses half filled with crushed ice. Top with sprig of Pineapple Mint for delightful aroma.



Chervil

PARKINSON, 1640

CHERVIL
(*Anthriscus cerefolium*)

CHERVIL is a tall, hardy annual from one to two feet in height. Locally, it thrives in cool weather, moist soil rich in humus, and partial shade, preferably that of taller plants or on the north side of a building. Sow the seeds in early August for robust plants in about sixty days. They will remain green under leaves or snow until spring. In May the main crop may be cut, as the plants quickly bolt to seed and self-sow if left undisturbed.

Chervil with its fragile, fern-like foliage and froth of milk-white blossoms signifies joy and gladness.

We use three methods of preserving Chervil: dehydration, freezing, salting. This herb is used extensively by the French. It may be used in any recipe calling for parsley. It is always one of the four "fines herbes"; the second is chives, and the others may be Savory, Thyme, Basil, Tarragon, as you choose.

Herb Butter: For fish, chicken, freshly steamed vegetables, or on canapes.

¼ lb. (1 stick) sweet butter
1 tsp. (or less) lemon juice
2 tbsp. fresh chopped Chervil, or
½ tbsp. dried Chervil (If dried Chervil is used, add 1 tsp. chopped chives or parsley for color).

Have the butter at room temperature, cream it and add lemon juice slowly. Blend in the herbs.

EMILIE SCHEMM

FLOWERS FOR A FRAGRANT POT POURRI

PETALS are used in the making of pot-pourri.

Red: Rose, holly, geranium, bee balm, peony, bergamot, carnation.

Pink: Hollyhock, dittany of Crete, hyssop, rose.

Orange: Calendula marigold nasturtium, tansy, coreopsis, elecampane.

Yellow: Daisy, primrose, flag, camomile, mullein, cowslip, buttercup, yarrow, pansy.

Blue: Cornflower, borage, larkspur, Anchusa, pansy, forget-me-not, delphinium.

White: Feverfew, hollyhock, yarrow, pansy.

Violet: Heliotrope, foxglove, lavender, pansy, flower-heads of mint and rosemary.

Gray: Santolina, "Silver King" Artemisia, wormwood, southern-wood, peppermint geranium.

Green: Leaves of sweet-scented geraniums, sweet basil, sweet marjoram, bergamot-mint, apple mint, orange mint, lemon balm, rosemary, and, to be ordered from an importer, the Asian mint patchouli (for a musty odor which gives a mellow fragrance).

THE DRY METHOD OF MAKING POT-POURRI

Gather the choicest blossoms. Be sure they are thoroughly dry. Strip petals from blossoms and spread loosely upon a wire- or window-screen. Elevate the screen between two supports for the air currents to reach both sides of the petals. Place in a warm, shady room. Turn petals until they are chip-dry. Store in a covered jar or container. Immediately add preservative.

To make perfume stock for pot-pourri it is necessary to add a fixative which is a material to absorb and help retain the fragrant oils which are so volatile. There are two types of fixatives, those of animal and those of vegetable origin. The latter are more preferred for our purpose—crushed orris-root (coarsely powdered) or calamus root, or benzoin-siam. Orris is the least expensive.

To the fixative add an equal portion of mixed spices (cinnamon, nutmeg, allspice, and a little mace). Mix these together, add enough essential oil to create a fine lumpy mass. It should be neither too moist to allow the oil to seep over the petals, nor too dry to have the powdered fixative and spices dust the leaves. If properly mixed it will have the appearance of dampened cornmeal and when sprinkled over and through the jar will, in about one month's time, season each petal with a lasting bouquet and fragrance.

Oils for delicate scent of flower fragrance are: synthetic rose, orange flower, lavender, lemon verbena, jasmin, and a score of others. Experiment with the oils until you find a pleasing fragrance. To one gallon of petals (of which roses should make up two-thirds of the bulk) add about 3 tbsp. orris-root, 3 tbsp. spice mixture, and enough oil or oils to moisten.

Other ingredients which might be added to give fragrance are: coriander and cardamon seed (pounded in a mortar), tonka beans also pounded, clove heads, spicy slivers of orange and lemon rind, sandalwood shavings, vetivert root, cut into small pieces, dried orange flowers, lavender flowers, and patchouli leaves.

MARY E. BAER

POMANDERS

WEBSTER defines a pomander as "a perfume or mixture of perfumes, enclosed in a perforated box or bag, and carried on the person, to guard against infection." He referred to the historic pomander ball, which Rosetta Clarkson describes so well in her book, "Magic Gardens." And our own Mary Baer brings us right up to date by reintroducing the custom of making fruit pomanders as a charming adjunct of today's living. So here's a bit from both Rosetta Clarkson and Mary Baer:

The name derives from the early French—*pomme d'ambre* — denoting an apple shape, and perfume (ambergris).

In "pre-sanitation days," rich and poor alike were offended by evil smells at home and abroad, and shared the same fear of infection in crowded places. Those who could afford it used the pomander ball to help them endure the noisomeness of streets and public places, and to protect themselves from germs. The common "man in the street" carried and sniffed at sprigs of Rue or Rosemary, in order "to live above the foul and filthy air".

The well-off could enjoy the costly pomander, its richly ornamented case filled with rare perfumes, but as the fad grew those who were not well off began to make pomanders they *could* afford, by simply sticking cloves into oranges, which were cheap, easy, and produced the same result.

The word "pomander" applied to the perfume ball, as well as to its receptacle. The foundation of the perfume ball was plain earth, or "good garden mold", or fine white wax, to give it bulk. The desired perfumes and fixatives were added, according to the varying recipes of the day, and the whole formed into a mass or ball which was encased in a receptacle of wood, metal or ivory, usually globular in shape, about 2 to 3 inches in diameter, made in halves which were hinged and held together by a clasp, and perforated to allow the perfume to escape.

Some perfumes used were: lavender, sweet bay; essential oils of cinnamon, cloves, sandal, cedar, lemon, jasmine; the "sweet waters" of rose, jasmine, orange flowers; shredded fruit rinds—orange, lemon, quince; the exotic spikenard, betel nut, lignum aloes, tragacanth, costus, labdanum. *Fixatives* to retain these scents included benjamin (benzoin), storax, ambergris, civet, musk, powdered calamus root of sweet flag).

Pomander cases were of wood banded with silver, or more often, of silver or gold elaborately worked and bedecked with jewels. The pomander was a rich ornament and worn on a chain about the neck or from the belt.

It was the custom in early times to give New Year's gifts, and the pomander was a favorite offering. The wealthy could vie with each other in the lavishness of their gift pomanders, while those who could not afford costly perfumes in fancy cases gave instead pomanders made of oranges stuck with cloves.

Present-day sanitation and the end-

less variety of germicides, deodorizers and perfumes have made the pomander as defined by Webster obsolete, but the custom of making orange pomanders as the holiday season draws near has persisted throughout the centuries, and few of us can resist the old-world charm of the fragrant fruit pomander. This is how Mary Baer taught me to make them:

Mary Baer's Fruit Pomander:

"Use thin-skinned, firm, fresh fruit: orange, grapefruit, lemon, lime, kumquat, apple, quince, pomegranate, and large full-headed Madagascar or Zanzibar cloves.

"Indicate four sections on the fruit and stud each quarter with cloves, leaving about ½ inch between each section for tying on the ribbon later. Allow to dry for about a month or six weeks.

"When thoroughly dried, roll in a fixative spice mixture (coarsely crushed orris root with an equal portion of spices—cinnamon, nutmeg, allspice and a little mace—and a few drops of oil of clove). Leave in spice mixture a few days, then brush off and tie with ribbons."

EDITH BARON

THYME

THE word "Thyme" may be traced back to a Greek word meaning "to burn; fumigate." To the Greeks, the name of the plant itself became one with its use. Before the 8th century B.C., and the introduction of oriental incenses, fragrant herbs were used in Greece. They were stuffed into the bodies of sacrificial animals to dispel the odors of burning flesh.

The uses of Thyme's fragrance are wonderfully illustrative of all the significances of perfume—as propitiation, as medicine, and as fumigator. All uses are interrelated. The word "perfume" means the odor given off with smoke ("per fumum"). Thus perfume was literally the first incense. Thyme's name gives it primal importance in all these things.

Thyme was extremely common in Greece and flavored the famous honey of Mt. Hymettus, so important in food, cake offerings, and mead. Thyme was spread on graves. It was one of the "simples" of Hippocrates and its perfume was believed to have medicinal powers curing melancholia, splenic diseases, and nightmare. It gave courage to soldiers who bathed in its infusions. It was mentioned by Pliny, Theophrastus, Horace, and Aristophanes.

MEREDITH CARSON

Savory

MATTHIOLI, 1560

BORAGE

(*Borago officinalis*)

THIS annual is native of the eastern Mediterranean region. The plant grows about two feet high; its oval leaves are rough and hairy. The beauty of the plant is in its pure-blue flower clusters. Because these clusters droop and are seen best from below they should be planted at the top of a slope. The flowers are unusually rich in nectar, thus the plant is good for bee pasturage and is referred to as "bee bread". It is also given the name "star flower" because of its five-pointed blue blossom.

The cultural requirements of Borage are a dry, poor, light soil in a sunny spot. It is easily grown from seed, and the mature plants should be spaced 12 inches apart. Because of their delicate root systems, seedlings should not be transplanted but weaker ones should be thinned out. Borage flowers quickly after sowing and it can be sowed at intervals during the summer to keep a succession of bloom.

The flowers and leafy tops were used to make the beverage known as cool tankard, a mixture of wine, lemon cider and sugar. They are also steeped in such cold drinks as claret cup and negus, to which they impart a cucumbery flavor. The flowers alone can be floated in cold drinks for decorative value and can be used to garnish salads. Cakes and cookies can be decorated with candied borage flowers. The tender young leaves can be used as a salad green, or can be cooked like a vegetable. Miloradovich recommends cooking them with other greens, using half and half. Dried or fresh Borage leaves can be used to make herb tea to be served hot or iced.

ISABEL ADREON

A pomander: from an old woodcut.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (April to November) and until six (November to April) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN

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lume XLIV June, 1956 Number 6

COVER: The native wild hyacinth *(Camassia scilloides)* flowering in the Mausoleum grounds. Planted in the ivy, which helps conceal the dying leaves when blooming time is past, it is very much at home. Its pale gray-blue flowers make an attractive display in early May.

NOTE: The St. Louis Herb Society not only turned in enough copy for an entire number of the BULLETIN (May, 1956) but several articles and a number of shorter notes remain to be published. Mrs. Klippel's and Mrs. Anderson's contributions appear in this issue. Other articles will be published from time to time during next fall and winter.

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Please: Do not discard a copy of the Bulletin. If you have no further use for yours pass it along to a friend or return it to the Garden. Return postage guaranteed.

Missouri Botanical Garden Bulletin

Vol. XLIV JUNE, 1956 No. 6

HOW TO USE A RIVER

KENNETH A. POOS

Introduction

WHY MUST the story of every river be a tragedy? Inherently it should be a gay or strong or placid story, with the excitement and beauty of the earth its theme. And yet who knows a river that is exultant with its destiny as that destiny has been determined by mankind? Rivers do not object to work, for that is born in them. But with mistreatment they can be disobedient, plotting, and vengeful. With great diligence we have brought out the worst in our streams. The time has come to restore them, to live with them, and to discover the rich sources of inspiration they can contribute to our lives. In St. Louis, we have a perfect place to begin such an adventure. In the following paper, written as a term report for my evening class in Ecology, but deserving much wider circulation, Ken Poos challenges us to take some action.

—ALFRED G. ETTER,
Washington University School of Medicine,
Clopton Experimental Farm, Clarkesville, Mo.

Upstream and Long Ago:—

THE Meramec River has many beginnings, but one of them is best. Meramec Spring is a place of wonderment, a continuing miracle of nature. Water, pure and forever coming from the earth, forever, deep, clear, and cold, it wells up beneath a moss-covered ledge and green eddys swirl down river into a wide gravelly bed. Between screens of willows the river sings softly to itself. The air is sweet with the smell of trees and wet earth, the unforgettable earth with its wildness, rawness, and utter familiarity. Frothy rapids melt into long crescents of smooth water. On summer evenings whip-poor-wills chant their vespers in endless succession from the dark foliage, and large-mouth bass slap at mayflies on the quiet pools.

Upstream much of the Meramec Valley is still a timeless place that contains in its autumn mists the magic of a primitive river, the memory of "old Octobers and tawny Indians in their camping places long ago." Half-asleep on a sunny gravel bar, one does not find it hard to imagine an Indian canoe floating on the water like a willow leaf, or a frontiersman quietly

A gravel bar at a river's bend.

watering his sweated horse in the shade beside some ford.

From Paradise to Problem Child:—

These illusions vanish quickly downstream! Over the two-hundred-year period that white men have used the lower river most that is primitive and beautiful has been destroyed. The automobile, the tractor, the chain-saw, the outboard motor, and the flush toilet have changed the river and changed it mightily. In the early days men stood on the stumps of trees and made speeches about prosperity and rising standards of living. Then they cut more trees and made more speeches and shot more squirrels and gigged more fish and cut more trees and made more speeches. And as they talked the fields got sandier and the fishing poorer. Then men from the city came to the river for recreation. They bought big lots and built clubhouses, and sold lots and built more clubhouses. so that in some places the river bank became lined with clubs. Here a man could relax on holidays and drink a beer and throw the empty bottle in the river. Now this man has sold his "haven" to a new occupant who lives there all year round and not only throws his empty beer cans in the river but all the trash, including the old ice-box and stove. "After all," he says, "it helps keep the bank from washing." The river has indeed changed mightily.

A Trip of Discovery:—

Nowadays taking a trip on the lower Meramec requires a good deal of courage—not the kind the pioneers possessed but the courage to see ugliness and to hope for some change. Put your boat in the river at Highway 66 and motor up past Valley Park and enjoy a visit to St. Louis' playground. The chances are you'll find the river low just as I did when I made the trip recently. This is not just because we've had a drouth, but because the channel has been clogged by years of mismanagement of the river. Tied up beneath the new "66" bridge were

two barges which had been used in its construction. They had been waiting several months for water enough to refloat. All along the banks of the river there was a litter of trash. "No dumping" signs were being ignored as usual. It was apparent that people drive down Yarnell Road and jettison paper bags of cans and garbage from their moving automobiles. Here, in cans and bottles mosquito larvae can live in peace, for fish and birds cannot feed on them as they would in natural areas. Man has created another problem for himself and he will no doubt solve it by calling for airplane spraying of the area; and so the mosquitoes will have their revenge upon the fish and birds.

The next thing to come in sight was a great number of shabby boat docks and boats. Packed closely together they stretch up the west bank to a point two miles above the Vandover bridge, and sometimes line the east shore, too. These docks are privately owned and serve only the interest of the owners and their friends. Public launching facilities are almost non-existent. Everywhere you are met with signs warning trespassers with prosecution. Signs proclaiming no hunting or fishing are also there in numbers as if there were anything to shoot or catch. Even if you find a place to launch your boat, you may still have trouble finding water deep enough to float it. My small motor hit bottom many times. I had to drag my canoe over the Valley Park rapids, and without a load this craft draws only two and a half inches. It is hard to visualize so big a river so feeble.

No Channel, No Fish:—

Even at drouth level this stream once had enough current to keep a channel. That was when trees staked down the alluvial banks along the river, and kept the water working. Now the burden of gravel that has been poured into the valley from cleared lands in the headwaters has nothing to compel it to build banks. The river is lazy, and when it comes to the level stretches of the lower basin it drops its load almost any place. The channel chokes up and the river spreads out over a broad shallow bed, or flows beneath the surface through the porous gravels.

Aside from the fact that this shallowing of the channel makes powerboating risky, it does even more important damage. Water temperatures become more extreme, hotter in summer and frozen more often in winter. This brings a change in the species of fish. Game fish abhor hot water.

There are many other factors working for a change of water temperatures in the lower river. Not the least of these is the fact that many of the trees that once shaded the stream have been cut down. Most of these were willows that hung out over the river's edge. They will be missed, not only by the fish and fishermen they shaded, but by the birds that nested in them—and what of that sweet willow fragrance that is the very breath of a river? The people that cut them probably associated snakes with willows and thought that by cutting the willows they would get rid of the snakes. They were right, but at the same time they

Endless flow of gall

disrupted the whole ecology of the river bank. What they didn't foresee was that they contributed to the loss of wildlife and fish, which they didn't want to lose. In fact, each bird, animal, and fish was a small reason that contributed to a big reason for going to live on the river bank in the first place. The sad part is that these people know the river has changed but they don't know why. I haven't talked with anyone yet who assumed his own personal burden of guilt.

The River's Martyrdom:—

As I continued up stream I heard water running in from a small brook. Under natural conditions I would have had the impulse to throw a dry fly to the spot in belief that a bass or even a trout might be facing into the current of the small stream, waiting for a bug or unsuspecting minnow. This was not the case here. There was a black pipe sticking out of the bank sending filthy, stinking gall into the river in an endless flow. This was the end of the Valley Park sewer system. Less than a mile and a half downstream the city of Kirkwood took it back in and processed it for drinking water until the early 1940's. Because of increasing high costs of filtration and fluctuating river levels they now use a drilled well for their water supply.

Without scientific measurement I would say that the pollution resulting from the sewage effluent is moderate. It has, however, had its effect in changing the aquatic habitat. Any one who has seen whole schools of suckers gobbling raw sewage knows what species is aided by its introduction into the stream. Sewage has become for the suckers a rather constant food supply. Perhaps we ought to be thankful that they are there to help break down the stuff!

There are a number of important reasons why sewage and other waste products can hurt a river. First of all, they can cause a change in the temperature of the water, not only by sheer physical exchange of heat, but more importantly, by chemical heating. Any one who has been in a barnyard in the winter knows that the ground can be frozen everywhere but where deposits of waste are concentrated. This same "heating" occurs when raw sewage is dumped into the river and is broken down there.

Raw sewage reduces the oxygen in a river. Species of fish that require a lot of oxygen have to move out or die.

I was not able to find a single fisherman who knew of any jack-salmon being caught in the fast water below Valley Park in the past three years. Until recent years, this particular fish was caught there in numbers. Oxygen deprivation may well be the reason for its disappearance. Reduced water flow during the last few years brought up the level of pollution. At the same time Valley Park, Kirkwood, and other municipalities within the Meramec watershed are growing rapidly and pumping more sewage into the river. One of the maintenance engineers of the city of Kirkwood admitted that during peak periods it was impossible to process all the sewage and it had to be "turned loose." Valley Park makes no attempt to process its sewage at all. Until the situation changes radically, bass and jack-salmon don't have a chance.

One of the hazards of boating on the Meramec, or for doing anything else on the river for that matter, is the chance of catching a stray bullet. This trip was no exception. I found a group of boys tossing cans and bottles in the water and plinking at them without any regard for wild slugs. They got a big laugh out of it when I told them that the river was not a dump and that they should do their target shooting somewhere else. Time and again I have found people using firearms in crowded areas and few ever showed any respect for the weapons they were using.

If we add all this mismanagement and negligence to the social problems that have arisen in the area, such as the high incidence of drunken brawls, crimes and drownings, we have a picture of the established character of the lower Meramec River basin today. You don't have to be a trained observer to see what is going on there. The tragedy of it all is that the community allows a wonderful natural resource to slip away and be lost because of a deep-seated lethargy!

The Need and the Solution Exist:—

The present recreational value of the Meramec River for the community of Greater St. Louis is negligible, in spite of its proximity to the vast population that sorely needs a clear-water recreational area with impressive natural beauty. Once a natural area is blighted it is increasingly subject to mistreatment. Add to the situation that now exists in the Meramec River basin a decade or two of abuse and the total loss to the community will be appalling. Estimates of population growth in this area leave no doubt about the need for greatly expanded recreation facilities near the city. *The lower Meramec is the place to find them.*

The Meramec meets the chief requirements for a first-class metropolitan park. It is large enough. It is within thirty miles drive of the average user. New highways exist that can carry the traffic. Water, the first goal of the recreationist, is available and with some planning and management it could be clean water in adequate quantity. Remnants of its old beauty still remain, in the quiet waters below still bluffs, and, with encouragement, wildlife could soon add much to the attractiveness of the park.

Recreation First:—

It is vital that *a master plan for the development of the Meramec should put recreation first.* I consider the proposal of a thirty-five hour week for workers a threat both to their own well-being and to that of the nation if there is no place for them to go and enjoy their leisure and employ it constructively. Flood control is important, industrial development is important, but preservation of physical vigor and mental balance of our people supersedes all of them.

Specifically:—

We cannot be too bold in planning for the obvious needs of the future, and for that reason it is felt that the following suggestions are well within the limits of a reasonable project.

1. Pool state and federal and local resources to purchase the entire flood-plain area and such adjacent areas as may be desirable from Tyson Valley Park to the confluence of the Meramec River and the Mississippi.

2. Institute a ten-year master plan that would include the demolition of buildings, cleaning up of litter, and return of the area to its natural condition.

3. Eliminate pollution.

4. Prepare some areas near the river for immediate use while construction proceeds on the remainder.

5. Build concessions which would be available for lease to private interests subject to Park Commission standards.

6. Make the park free to all.

7. Draw up a *diversified recreational program* including:

a. Safe swimming areas that could be supervised, preferably swimming-pools.

b. Picnic areas, including tables and barbecue pits, that afford a view of the river.

c. Ball diamonds, tennis, basket-ball, and volley-ball courts, etc., adjacent to picnic areas.

d. Overnight camping areas for tent campers.

e. Main lodge for nature lectures, motion pictures, and other activities.

f. Summer camps for children.

g. Area for riding concession.

h. Primitive area for study of fauna and flora.

i. A rifle and pistol range that could be supervised by the National Rifle Association. Competitive matches and instruction in proper handling of firearms should be part of the program.

j. A similar program for archers.

k. Waterfront area which would include launching ramps and canoe rentals. Canoe instructions available, and speed limits for boats to be five miles per hour within the park river area.

l. Areas where school children can come and help reforest the area and learn basic principles of land use and ecology first hand. (Motion becomes emotion.)

How About Floods?—

Almost all of these activities could, if properly planned and carried on, be adapted to the conditions that exist in the valley at present without elaborate flood-control structures. With complete control of the flood plain,

It takes courage to see ugliness and hope for a change.

the occupants of the valley would not be claiming high-flood losses and burdening governments and charitable agencies. Further developments in the region would be halted and a hundred future headaches would be cured before they began.

A current proposal to build a barrier dam across the Meramec would be unnecessary. This proposal, by eliminating the Meramec Valley as a reservoir for flood waters, would only aggravate flood conditions on the main Mississippi. It is also a matter of speculation whether such a reservoir as has been proposed would literally hold water since the underlying strata near the confluence of the Meramec and Mississippi rivers are full of solution caverns. In addition, a barrier dam presumably would include locks, thus permitting use of the valley for navigation and consequently encouraging heavy industry. This would be fatal to any recreational development on the river for many reasons. A stable reservoir thus created would also become a liability within a short time by creating extensive marsh areas, drowning timber stands, and by aggravating mosquito problems. Even more important, it would serve as a catch-all for silt and gravel, and within a short time the head of the reservoir would build up so that future floods in the Valley Park region would be beyond anything experienced in the past. With the valley devoted to recreational use, the need for expensive dam building, either upstream or down, would be greatly minimized. Good land use in the water-shed would still be of great importance. In the long run, the program suggested would be a money- and headache-saving plan for governments at all levels. They should be glad to contribute funds for its accomplishment.

Paradise Regained:—

If the lower Meramec River basin were restored to its natural conditions as much as possible, it would give to the community the kind of environment mankind needs: a place where a man can go after work and sit on the quiet river bank in meditation, a place where a boy can fish with his cane pole, and where the family can enjoy the adventure of a camp out. This would be a sanctuary where men and women and children of future generations could come and see a cool flowing stream, singing birds, and green grass. "The leaf, the twig, the unfound door, Return, Return!"

Book Reviews:—

What's New in Gardening. By Dr. P. P. Pirone, Plant Pathologist at the New York Botanic Garden. 244 pages plus Index 11 pages. Hanover House, New York, 1956. Price $3.50.

The author planned to report items new to gardeners during the last two years, but has included some of the fundamentals which, though not new, yet have great value now and for many years to come.

The first 110 pages, divided into six chapters, discusses plants under expected titles: Annuals, Perennials, Bulbs, Roses, other Shrubs and Hedges, Trees—shade, ornamental, fruit—, Vegetables, and, happily, House Plants. The remainder of the book, 123 pages, deals with practices involved in the successful culture of plants under the logical, albeit somewhat unusual, titles for such a small book: Plant Propagation, Lawns, Landscaping, Soils and Plant Foods, Growth Regulators, Insects, Diseases and Pests, Garden Gadgets and Equipment.

In general, the book will be found useful by the more experienced as well as the novice gardener. It is certainly worth the price. This reviewer felt the author was sacrificing a great opportunity to give of his knowledge by saying so little about so many subjects. He also feels that the millions who are starting their first garden this year would be quite well repaid if they could have somewhat more detailed information on a smaller number of subjects by the same author. After all, one of the biggest news items in gardening is the large increase each year in the number of gardeners. Or, if we choose to let them learn to walk while we help the more experienced run, then we suggest omission of the extremely short and possibly pithy (certainly containing little meat) paragraphs which are largely made up of four to six lines to mention a few characteristics of some varieties of plants. This deletion would permit the book to give more space to the variations in culture needed by the various climatic zones. It would help, of course, to include as a fundamental the map of Hardiness Zones and to discuss some of the factors by which hardiness is limited, even if trends rather than absolute data must be used. While some statements clearly refer to areas as Midwest, Southern, and Pacific Slope, in general this book does not recognize some of the newer concepts of climate and microclimates. This reviewer feels that listing varieties helps gardeners less than bringing the fundamentals up to date.

The author really puts sparkle into his book when he tells the story of how a paleobotanist described *Metasequoia* from fossil specimens when the tree was believed to be extinct, and how, three years later, by sending $250 to China, bushels of seed of this tree, the Dawn Redwood, came to America and make it possible for thousands of seedlings to be shooting skyward at the rate of 2 to 4 feet each year. [Note those near the path which leads directly south from the old Shaw Residence at the Garden.]

His remarks on Holly are not so fortunate when he says, " . . . one of the most beautiful hollies I have seen is *Ilex altaclarensis*, James G. Esson . . .

resembles the finest English Holly . . . far more striking than any American Holly." It would have been helpful to have the species name so as to furnish some basis for determining probable utility value of the author's nomination. It is no doubt more difficult to maintain an even balance of fact and opinion in a book than in a review. Perhaps the real reason for writing reviews is to call attention to books and really help potential readers to enjoy a new book.

There are several truly exciting spots in the book. One is the story of the discovery of the New Dawn Rose. "How New Plant Varieties Arise" would justify the title of the book. The second subject is given almost nine pages of interesting, fast-moving factual statements which ably presents the concepts and implication of the terms Sporting, Hybridization, Natural Selection, Mutation, Natural Bud Sports and Chimeras! While much of the facts come under the title of worth-while fundamentals, they form a substantial foundation for the very good story of the development of the "Mother of Millions" which the author finally admits is a Male Tree.

The chapter on Propagation is well done while the chapters on Landscaping and Soils and Plant Foods would have been of more value if the author had encouraged the reader to seek and follow local professional advice, either from the agricultural extension agents or professional landscape architects.

When dealing with Growth Regulators, Weed Killers, and Pesticides the author writes of the field in which he is truly an expert. He shows this in his insistence on the integrity of the labels being placed on packages of pesticide by the manufacturer under the watchful and well-informed supervision of the U.S.D.A. He shows quite simply and effectively that pesticides which kill insects are often toxic to warm-blooded animals and that most gardeners who use the millions of pounds each year are not as contemptuous of garden chemicals as are those who are careless in using aspirin, other salicylates, and petroleum products. The author helpfully divides the more than 2,500 trade-marked insecticides, fungicides, and related materials into less than twelve categories. He then discusses the principal ingredients and their suitable application for control of pests from mites to deer and from degree of eradication to the rate of disappearance of residue left on plants. The last chapter deals with Gardening Gadgets. No doubt its information is helpful but hardly exciting, except for one short comment on a soil moisture recorder.

As one lays the book aside and ponders, the thought expressed earlier in this review recurs. Why doesn't he write other books on more limited subjects? The few pen-and-ink drawings and black-and-white illustrations do much the same for the reader as do many of the short paragraphs devoted to really large subjects. The book stimulates; it contains some real food and leaves the reader hungry for more information about how and when to put water on his garden, and what plants would do well in his area. What more should one get for $3.50.

—CLARENCE BARBRE

Vascular Plants of Illinois. By G. N. Jones and G. D. Fuller. 593 pages. University of Illinois Press, Urbana, and the Illinois State Museum, Springfield, Illinois. 1955. Price $10.00.

THIS is a companion volume, particularly treating the ecology and distribution of the plants of Illinois, and is designed to be used with the earlier work, *Flora of Illinois* by G. N. Jones. 1950 (second edition), which contains the keys and descriptive information. The valid names of the plants with author and reference, synonymy, all known references on the occurrence of the species in Illinois, flowering time, general distribution, habitat and distribution in Illinois, with maps, has been compiled for the more than 2400 species which occur in the state. A vegetational map and descriptions of the vegetational divisions including the characteristic plants are given in the introductory matter. An extensive bibliography of works published pertaining to the flora of the state and the principal collectors are given. These are the data. From this and other works like this it is possible to study fundamental problems related to the evolution of plants, their origins and relationships. In Illinois where much of the land has for many years been intensively cultivated there are special problems related to the plants man has eliminiated and introduced. Such matters cannot be adequately discussed until documented facts on the kinds of plants and where they grow are presented. This represents a tremendous amount of work, compiling, recording and checking, and it is done here with much thoroughness.

Some difficulty is encountered in identification of plants due to the limited descriptive matter in the two volumes although a manual supplements this lack. It is a most critical work and will be useful not only for botanists but agriculturists, teachers and students. Gardeners who specialize in native plants rather than exotics will find an unlimited list of horticultural possibilities, among them ten kinds of Dogwood, nine of Phlox, five Mallows, twelve Roses and hosts of Hawthornes and Sunflowers.

—ALICE F. TRYON

Garden Design, Illustrated. By John and Carol L. Grant. University of Washington Press. 145 pp. Seattle, 1954. Price $5.75.

SOME amateur gardeners become so pleased that they can grow anything at all, especially if it is colorful, that they never get beyond this kindergarten stage in gardening. But if they have learned the knack of moving a shrub without the plant feeling the shock of it, and if they have learned what plants grow where, and when and how they bloom, they should be ready for the next stage—which is designing a garden.

Books on garden design are frequently too technical or too ambitious for the amateur. Some of them speak of "building" a garden, which brings up visions of surveys, blue-prints, construction, and probably a greater outlay of time and money than most dirt gardeners have. Grants' "Garden De-

sign" is not that kind of a book. As the authors say in their introduction: "The purpose of this book is not to outline a cut-and-dried approach to garden design . . . rather to open up vistas of possibilities through the understanding of naturalistic principles." It has no text-book attributes but is written with simplicity and charm. It can be enjoyed by all garden lovers, whether they grow plants or just walk through them. The authors have been successful in putting their lessons across by illustrations—plans, photographs, and anecdotes. Most of the gardens illustrated are in the Pacific Northwest, so the planting could not be exactly duplicated here. However, the principles of design are the same no matter what the geography, and with a little imagination a middle-western shrub or tree could be used to give the same landscape effect as the northwestern one suggested.

Many people think that a designed garden means a formal garden but the authors dispose of that in a few words in the first chapter. What the book does is to help the beginner adapt the arrangement of living material to the site, to make the planting appear to have happened rather than designed. If you want your garden to have a naturalistic look, which most amateurs strive for, read the chapters twice on Naturalistic Character, Scale, and on Foundation Planting. Color, Drifts ("planting with the wind"), Contours and Curves are also explained and illustrated. One chapter takes up a specific example—a moderately large house on a 60 × 100 foot lot—and tells us in words and pictures the landscape problems connected with it and how they were met.

If the beginner only looks at the 65 illustrations in this book he will learn something about design, and the chances are that reading it might arouse a spark of ambition to make his back-yard more attractive—maybe even to make it a "*garden*".

—NELL C. HORNER

Cities in Evolution. By Patrick Geddes. xxxi + 241 pp. New and revised edition. Oxford University Press. New York, 1950. Price $3.75.

We scientists are an ignorant lot of people. Until I was asked to review this book I had never read a word by Sir Patrick Geddes and was familiar with only the most fleeting references to his career. I had no idea that he was trained as a botanist and only the haziest notions as to his professional history. Yet I do read widely in a haphazard, undisciplined sort of way and part of my technical training was in England. I have therefore had a better chance than most present-day American scientists to have blundered across his trail somehow, in a book or at an exhibition or in conversation. That it is a trail still worth coming upon (whether accidentally or by design) will be clear to any thoughtful person who goes through this book. Some of the best of his writing is attractively brought together with thumb-nail biographical references and a selection of illustrative material from one of his big exhibitions, the whole effectively integrated with editorial com-

ment and a few personal recollections.

Geddes had a genious for seeing large complicated problems as a whole and a gift for communicating these insights with apt phrases:

> "Coal will still last a long time, and cotton might expand accordingly, but water is the prime necessity after air itself; and, unlike it, is limited in quantity. Food can be brought for almost any conceivable population as long as ships can sail the seas, and we have the wherewithal to buy; famine one can survive for months; total starvation even for weeks; but without water we can last barely three days . . . those innumerable costermongers' barrows of cheap and enormous bananas, which range through the poorer streets of New York, and grimly suggest a possible importation of tropical conditions, towards the maintenance and multiplication of an all too cheap proletariat . . . Thus to take only one of the very foremost of our national luxuries, that of getting—more or less—alcoholized, this has been vividly defined in a real flash of judicial wisdom as 'the quickest way of getting out of Manchester'."

He was quite as eloquent in his original field of Botany. Here are two excerpts from his last official lecture at Dundee, and remember, he did not write this; it was taken down by one of his audience.

> "How many people think twice about a leaf? Yet the leaf is the chief product and phenomenon of Life: this is a green world, with animals comparatively few and small, and all dependent upon the leaves. By leaves we live. The world is mainly a vast leaf-colony, growing on and forming a leafy soil, not a mere mineral mass; and we live not by the jingling of our coins but by the fullness of our harvests . . . An Assyrian sculptor admired this Acanthus leaf, and modelled it; and it has been copied ever since, and by all the schools, till we are weary of it. In each great period of design, new plants have been observed and used by artists; but here in the garden around us there is a whole world of beauty for designers to choose from—only the edge of which has been touched."

This same report of his final lecture gives us echoes of quite another matter, Geddes' relationships with his own university where he was nominally professor of botany, though by the terms of his appointment he was required to be in residence only one term a year and the rest of the time was free to write or to travel as he wished. We are told that though reporters were present at the final lecture and a good many townspeople, there was little in the papers the next day. Even more significantly, the faculty of the college was absent and its governing body too, and this was a matter of comment among those who did attend. Even though Dundee had given Geddes a professorship when he had been passed over at Edinburgh as too unorthodox, thirty years of world tours and exhibitions here and there, of taking his students through gardens and woods rather than to lecture indoors, had made him somewhat of a truant in his own university. One notes in his own lecture an ironic reference to Dundee as "this city of marmalade," and his description of the botany field trips of other professors as "week-end airings conducted by a sort of academic nursemaid given to pedantic language." Somewhere in this area is the nub of the Geddes story. He was eloquent to the point of genius, and of all native endowments, none more than eloquence has the capacity of bringing special problems in its train. A little eloquence will help almost any man. A shower of it and the world wants to hear; it is difficult to get on with one's regular work, however much one may wish to do so. Privacies are invaded, the ordinary schedules

of daily life and work are upset; jealousies are multiplied, one's whole career is thrown out of balance. Read Whistler's "Ten O'clock Lecture" in *The Gentle Art of Making Enemies* for a waspish account of the problems which come with such gifts. Eloquence gives us the power to corrupt others whether we mean to or not and ultimately to corrupt our own ends. No gift requires greater wisdom to use cannily. Geddes was warm-hearted, imaginative, and greatly eloquent. How effectively did he deal with the special problems brought upon him by his own genius?

—EDGAR ANDERSON

THYME

BOTANICALLY, the genus Thymus is a ragbag, all jumbled together, so that names and species mean little. Plants range from a low, creeping true Mother-of-Thyme to a woody, bushy type, which is almost shrubby. Blossoms may be lavender, blue, pink or even red. The average height is six to eight inches, but varies in either direction. Flowers are in spikes, and are so tiny one can barely distinguish parts—only the spike and color. The plants grow in mats or mounds when given plenty of spreading room, sunshine, and a well-drained location.

Seeds of Thyme are round and very tiny. Mix with sand to sow thinly on gravel, chat or even cinders, or in a very well-drained spot where the soil is not too rich. A slope is fine. Water well at first, until plants are well established. Plants may also be propagated by root division.

Medicinally, Thyme is one of the few herbs whose use has not declined in modern times. Extracting the oil is still big business. Thyme is strongly germicidal, with an action resembling that of carbolic acid, but stronger and less irritant to wounds. It is used to medicate surgical dressings, in anaesthetics, in gargles and mouth washes, as a sedative for coughs and bronchitis. It yields three essential oils: cymene, thymene, and thymol. Thymol is most used.

In cooking, Wild Thyme is the mildest, but all are useful in binding herb mixtures for soups and salads. The Romans used it for flavoring cheese and liqueurs. Spanish people infuse it in the pickle for preserving olive. Thyme is a distinct addition to pea or bean soups, tomato juice, stuffings, potato salad. Lemon Thyme makes good tea and is good cut fresh in fruit salad.

Armenian Dolma: Grind meat from lamb shoulder. Rub bowl with onion or grate one onion to put into meat. Add three teaspoons of dry Thyme. Cover bowl and let stand for several hours. Add a half-cup of uncooked rice. Add tomato sauce to moisten. Wrap in cabbage or grape leaves. Steam 1½ hours. Serve with wedge of lemon.

Lemon Thyme Vinegar: Heat a good wine vinegar until warm but not boiling. Pour into bottles in which are some bruised Lemon Thyme sprigs. Let stand at least six weeks.

—DOROTHY ANDERSON

PARKINSON, 1640

BASIL

BASIL is a native of India. The derivation of the name is the subject of much controversy. According to some sources it comes from the Greek *basilikon* meaning "kingly", because, as Parkinson says, "the smell thereof is fit for a king's house." Others attribute it to a shortened version of "baselisk", a fabulous creature that could kill with a look. This might have come from the old herbalists' association of Basil with scorpions or because it is under the zodiacal sign of the Scorpion. It was also considered a symbol of hate in some countries. Quite to the contrary and much more in keeping with its delightful nature is the Italian tradition that Basil is symbolic of love.

Basil is a plant that can offer you everything from a variety with such religious significance that no true believer in India would be without it for a moment, to a deep purple plant that goes equally well in the salad or the centerpiece.

There are at least 35 varieties of Basil; however, the following varieties are the ones more generally used.

Ocimum basilicum:

Sweet Basil is the best-known variety of the herb. Its narrow, light green, ovate leaves emit a strongly clove-like perfume when crushed. Its square stems reach a height of 30 inches, topped with whorls of small white blooms.

Lettuce Leaf is a taller form with large, often curled leaves. The blossoms are more compactly arranged.

Purple Leaf is a tall form with large, deep purple leaves and pink flowers.

Ocimum minimum:

Appears with green leaves and white flowers and also with purple leaves and purple flowers. These are compact little bushes about a foot high.

Lemon Basil is a more recently introduced variety with more ovate, lighter green leaves. It has a decidedly citrous odor.

Ocimum sanctum:

Tulasi, or Sacred Basil, is a holy plant in India. To the Hindus it is a protector from evil and a key to Heaven. Members of that religion must be adorned with a sprig of Basil when dying. A plant of Basil stands on the altar of each Brahmin household.

Sacred Basil is easily distinguishable from other Basils by its hairy, heavily veined, roundly ovate leaves and its strong pungency. The flowers are pinkish with orange stamens.

Basil's culture requirements are a fairly rich loam, full sun, and adequate moisture. It can be sown in the open after the ground is warm. It germinates quickly and transplants readily at any time after four true leaves appear. Being a native of warm countries, it likes the hot nights and humid days of midsummer and is especially well adapted to our St. Louis climate.

Basil seems to have a special affinity for tomato and egg dishes. It is used fresh or harvested and dried, or made into vinegar which adds a real zest to French dressing or tomato cocktails.

—ALLENE K. KLIPPEL

GRASS EXHIBITS AT THE GARDEN

By mid-May the Garden's turf and ground-cover program advanced another step with the installation of simple semi-permanent signs calling attention to the kinds of grass and the effects on them of various treatments such as fall fertilizing and high mowing.

Lawn grass in this part of the Midwest is a very special problem. We are too far south for northern grasses but too far north for all but a few of the southern or "hot weather" grasses. There is no perfect grass for St. Louis; Kentucky Bluegrass is still the best for this region but it has to be carefully managed, particularly in extremely hot weather (when it goes dormant) or during long-continued droughts.

During the last two seasons various areas with some bluegrass in them have been allowed to go to seed at the Garden in an attempt to seed-in strains which were best adapted to a city garden. Last fall all the turf areas were heavily fertilized as soon as the nights turned cool. Both of these policies have paid off well and there is now more and better-looking bluegrass at the Garden than for many years. Most of it is being mowed high, at about four inches, since low clipping removes much of the leaf surface on which its health depends.

The new signs were designed, constructed, and donated to the Garden by Mr. Paul Hale of the Garden's Horticultural Council. They are of light metal and are held a few inches above the turf but are slanted so that they are easy to read. The actual sign is lettered free hand with India Ink and then weatherproofed with a plastic spray. They are so simple and easy to care for that they can be removed during mowing and can be changed from season to season or year to year.

Mr. Hale is now preparing a set of smaller signs to identify the most important turf weeds as well as some of the lesser-known grasses. This is all part of a long-time program for better lawns in the St. Louis area. Though grasses all look much alike, they differ markedly in their requirements, their times and patterns of growth, and their response to low or high mowing, to spring or fall fertilizing, to summer sprinkling and to heavy irrigation during droughts. Not until at least a handful of gardeners have gotten to know and part way to understand the lawn grasses of St. Louis can we hope to have the best possible lawns in this community. Golf enthusiasts have demonstrated what can be done for the management of putting greens and fairways; some of these special grasses and cultural practices can successfully be translated for the average homeowner but not very often.

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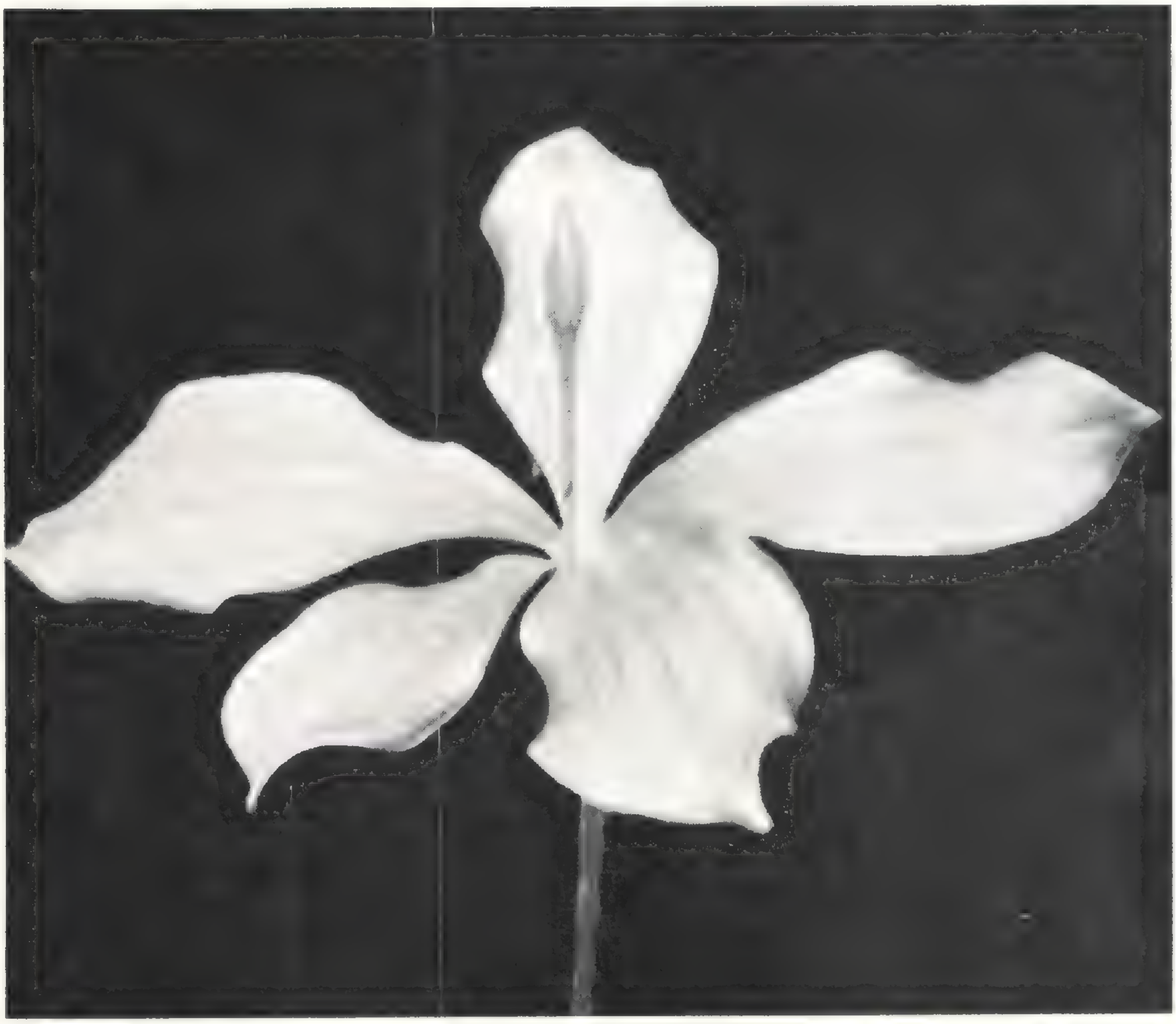
SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (April to November) and until six (November to April) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 a. m., but is closed on Saturdays, Sundays, and holidays. There is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN



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Please: Do not discard a copy of the Bulletin. If you have no further use for yours pass it along to a friend or return it to the Garden. Return postage guaranteed.

Missouri Botanical Garden Bulletin

Vol. XLIV SEPTEMBER, 1956 No. 7

SEPTEMBER IS THE TIME TO BUILD YOUR LAWN

SEPTEMBER 1 to November 15 is the time to work on your blue-grass lawn. You can have a good lawn in St. Louis by following these suggestions:

1. Cut all crab-grass as short as possible.

2. Spread a good commercial fertilizer. About 60 pounds will be needed for a small city lawn (30 lbs. to 1000 sq. ft.). Water it in on the same day with a gentle spray.

3. If you have many dandelions, plantain, or other broad-leaved weeds use one of the selective weed killers containing 2-4-D, on the first warm day. Wait at least one day after fertilizing and at least three days after using the weed killer before planting new seed.

4. Sow the best-quality blue-grass seed (or a *good* lawn-grass mixture) and sprinkle lightly after sowing. The ground needs to be kept moist for at least three weeks. Sprinkle the area lightly every evening if there is no rain.

5. Remember blue-grass does its growing underground and when the nights are cool. Take good care of your lawn every fall and you'll have a good lawn.

6. Never fertilize after early March. Blue-grass wants to go dormant during hot weather when weed grasses are most active.

7. Do not *sprinkle* your lawn in summer unless you want weed grasses to come in. If the ground is dry give your lawn a good *soaking* once every ten days but do not sprinkle.

EASTERN WITCH HAZEL *(Hamamelis virginiana)*

EASTERN WITCH HAZEL

JULIAN A. STEYERMARK

'Twas the night before Labor Day, 't was the night before Hallowe'en, 't was the night before Thanksgiving, 't was the night before Christmas—and at any of these particular occasions, if we chanced to be outdoors in certain parts of the southeastern Missouri Ozarks, especially along rich, shaded, north-facing wooded slopes along streams, either in granite or limestone country, we might welcome an unfamiliar yellow-flowered shrub whose fragrance filled the air. I am referring now to the Eastern Witch Hazel *(Hamamelis virginiana)*. It is well known to the folks of the eastern half of the United States, mostly east of the Mississippi River, as the last of their native shrubs of the year to bloom.

"When the frost is on the punkin, and the fodder's in the shock," when the autumn nights begin to take on that certain briskness, when the graceful sprays of the last purple- and white-rayed asters and yellow goldenrods enliven the forest slopes—days in October and November—that is the time our Eastern Witch Hazel takes on especial importance. Up until then it has seemed like any other shrub of the woodlands, its branches bedecked with numerous leaves. But as the tiny buff-brown buds begin to open—sometimes in late August, sometimes in September or October or November or even December—behold, suddenly a new yellow patch of color appears in the woods! The once-drooping flower buds now take on prominence as from each one four tiny yellow ribbon-like petals uncurl and eventually straighten out, each nearly two-thirds of an inch long. These are so delicate and frail-looking as to appear to have been cut out by a tiny hand with a small pair of scissors. And there are hundreds of these sprinkled all along the spreading, wand-like, pale gray branches so characteristic of the Eastern Witch Hazel. The mass effect is indeed refreshing to behold. Frequently, at blossom-time, all the leaves have dropped off, accentuating the yellow-studded bare branches. But this shrub knows no hard-and-fast rules to hold or not to hold the leaves while flowering, because, as often as not, the leaves remain attached to the branches during the flowering period.

The leaves are mostly oval or egg-shaped with wavy edges. During the spring and summer they are pale green, but turn a solid yellow when autumn colors begin to run rampant. But as the leaves disappear from the branches, the deceptively fragile-looking flowers hang on. Instead of falling after a few days or a week of blossoming, as is the habit of many other species of plants, these four-petaled blossoms continue—and how they do! They are so tough that they are not fazed by snow, sleet, or ice. I have seen these "toughies" resist November and December snow and ice storms, with the temperature near zero, yet they appear afterwards none the worse for it. I have seen these shrubs remain in flower during prolonged cold wintry spells when it would seem that no living

flower would stand a chance against the bitter weather. So there is something remarkable about the powers of resistance of the protoplasm, the living make-up of such a tiny flower.

It is difficult to state whether or not the protoplasm of the flower during such cold spells goes into a state of suspended dormancy or lifelessness. However, it is certain that the blossom is anything but dead, because at some time during flowering the tiny pollen from one of the four stamens is transferred to one of the two short styles of the minute pistil, usually of another flower, and the life processes of pollination and of fertilization take place —even on a cold November or December day. This process goes on, indeed very slowly, but during the following year what seems like a miracle happens: the tiny two-chambered ovary, with an even tinier ovule in each chamber, the whole no larger than a pin-head, gradually enlarges and finally turns into a capsule about half an inch long. This capsule eventually matures and splits open, ejecting with sudden force the two black, shining bony seeds within. Thus, nearly a year's time has elapsed from the opening of the first flower to the onset and ripening of the mature fruit the following autumn.

What a remarkable life process has taken place. Yet, like many another flower whose fragrance is "wasted on the desert air," the Eastern Witch Hazel is all but unknown to Missourians in its native haunts. To see it, one must travel into the Ozarks of southeastern Missouri—Reynolds, Iron, Madison, Shannon, and Carter counties. These five counties are the only ones in the state where it has been found wild. It favors rich, wooded hillsides usually facing north where it thrives in the relatively cooler and moister atmosphere of such locations. Places where it may be seen to advantage are: along the East Fork of the Black River at "Johnston's Shut-in" and along the ravine of Cook Spring branch in the Clark National Forest, both located in Reynolds County; along limestone wooded bluffs of the St. Francis River in Madison County; on Cardareva Mountain along Current River in Shannon County; along the "Royal Gorge" in Iron County; and along various creeks in the Clark National Forest in Carter County. But there are many other places, too, where it may be seen in these counties, if one likes to hike. Here in the Missouri Ozarks it reaches one of its known southwestern limits of geographical distribution.

The Vernal or Ozark Witch Hazel *(Hamamelis vernalis)*, on the other hand, is much more familiar to Missouri people who travel through the Ozark region. From January to April it flowers along Ozark streams, following water courses, and especially on gravel bars of such rivers as the Meramec, Niangua, Gasconade, Piney, St. Francis, Current, Eleven Points, Jacks Fork, Black, White, North Fork, and their tributaries, and along rocky draws of smaller branches. It is the first of the shrubs to flower in the Missouri Ozarks and is found throughout

the Ozark region south of the Missouri River ascending the Meramec River nearly as far as, but not quite to, the Missouri Botanical Garden's Arboretum at Gray Summit. Instead of the yellow flowers of the fall-flowering Eastern Witch Hazel, the Vernal species has flowers of an orange or even reddish hue, and even more fragrant than its eastern relative. Although both kinds are sometimes found in the same general locality in the Ozarks, the Vernal Witch Hazel usually hugs the margins of the streams, especially the gravel bars, while the Eastern Witch Hazel inhabits the cooler, lower and middle forested slopes usually above the stream banks. Besides being native in Missouri, the Vernal species is found in Arkansas, Oklahoma, and Louisiana.

THE LORE OF MINTS

WHEN the nymph Mintha, beloved by Pluto, was turned by jealous Proserpine into the plant Mentha, she became with her various faces both a delight and a source of confusion to mankind. Traveling with human migrations, mints were known in ancient times. They were introduced into England with the Roman conquest and into the United States with settlers. Peppermint escaped wild here before 1672. It was the first mint to be grown commercially by 1855, in Michigan. The American Indian used mint as a pot herb, a cure for fever and as perfume.

Mint was used in witches' brews, by doctors in drinks to clear the mind. Its odor stimulated the brain and it was made into orator's wreaths. The sacred perfume Kyphi burnt by Egyptians at sunset to Re contained mint. Pliny lists forty-one diseases curable by mint. The plant was strewn on the floors of Roman baths and theatres.

Peppermint from Asia was the Chaldeans' aid to digestion, and an early rat repellent. Spearmint was called "Our Lady's Mint," "Lamb Mint," or "Sage of Bethlehem." It was used as a meat relish in Roman feasts. Wine was scented with it; Bergamot mint endows chartreuse with bouquet even today. Horsemint was believed to be one of the bitter herbs of the Passover. If wounded soldiers ate it they would never recover. During Pompey's time it was thought that chewing it repelled the dread parasitic worm of elephantiasis. Field mint was used in Japan for centuries as a source of menthol for medicine. Pennyroyal's name "Pulegium" comes from the Latin "pulex" —flea, and "agere"—to drive. It was also a cure for coughs. Virgil said that deer when hurt sought it out to cure their wounds.

Old herbals said that one could tame a "wild" mint for one's garden by sowing the seeds with the sharp ends down! But anyone knows that the lady Mintha is untameable!

—MEREDITH CARSON

RARE MISSOURI PLANTS—IV

Whorled Pogonia or Purple Five-leaved Orchid

JULIAN A. STEYERMARK

At the time (1935) of publication of the "Annotated Catalogue of Flowering Plants of Missouri" by Mr. E. J. Palmer and myself, this orchid had not been recorded for the state. But a few years later in the Herbarium of the Chicago Natural History Museum (formerly Field Museum) I discovered a pressed specimen of this species collected on August 3, 1897, by Savage and Stull from Butler County, southeastern Missouri. This record was verified by the orchid authority, Dr. Donovan S. Correll.

Beginning in the spring of 1951 a new drama unfolded. Mr. Oscar Petersen, a life-long friend of the writer, and well-known in the St. Louis area as a poet-naturalist, an enthusiastic lover of flowers, and a charter member of the St. Louis Wild Flower Club, at age 85, was tramping around one of his beloved wild beauty spots of Nature, unmarred by man, and accidentally stumbled onto a large colony of the Whorled Pogonia orchid in one of the Ozark counties of southeastern Missouri. He wrote me an enthusiastic letter about this great discovery, and included a sketch of the orchid. Just a single young flower was seen in the entire colony, and, like a good conservationist, he had left it there. We could not be sure, therefore, what kind of Whorled Pogonia it was. For there are two kinds, the Smaller Whorled Pogonia or Green Five-leaved Orchid *(Isotria medeoloides)* with the flowers stalkless or nearly so and the sepals pale green, and the Whorled Pogonia or Purple Five-leaved Orchid with the flowers on a stalk an inch or more long and with brownish-purple sepals. The discovery made by Mr. Petersen was all the more remarkable because it was found in a general area that had been visited many times by botanists. This particular spot, however, apparently had never been searched until Mr. Petersen came across it.

The following June I visited the place with 86-year old Petersen, known to members of the St. Louis Wild Flower Club as "The Vagabond Dreamer," as chief and only guide. There were three colonies of the orchid with a grand total of nearly 150 plants. One colony of about fifty plants occurred in a rather level bottom along a small creek in a ravine hemmed in by La Motte sandstone bluffs and shaded by alder *(Alnus serrulata)*, sassafras, Flowering Dogwood, Red Maple, sapling Black Oak, Sour Gum, Hop Hornbeam, and native azalea. Other plants growing around the colony were early Sweet Blueberry *(Vaccinium vacillans)*, Sawbrier *(Smilax glauca)*, Hispid Goldenrod *(Solidago hispida)*, St. Andrew's Cross *(Ascyrum hypericoides)*, Yellow False Foxglove *(Gerardia flava* var. *macrantha)*, and Pigeon Grape *(Vitis cinerea)*.

The other colonies, containing approximately 100 plants, were found about 90 feet away and 15 feet higher

up than the first colony on the north-facing slopes of the same ravine, but in slightly drier soil covered with a dark green moss *(Dicranum scoparium)* and dominated by azalea, early Sweet Blueberry, and Sour Gum. The dominant trees in this ravine were Southern Yellow Pine, White Oak, and Shagbark Hickory, and the soil was decidedly acid.

At this time of year (June 7) the plants were at the stage of early fruiting and the young fruits were standing erect on definite stalks nearly an inch or more long. The identity of the orchid was now clarified: it was the Purple Five-leaved Orchid that has the flowers or fruits on definite long stalks. Also, the fact that the plants occurred in colonies, rather than as isolated individual plants, confirmed the identification as being this orchid and not the Smaller Whorled Pogonia. The latter was found in 1897 in Bollinger County by Mr. Colton Russell and has never since been seen, so far as records indicate.

Mr. Petersen has made annual pilgrimages to this spot since 1951 and reports tales of erratic behavior on the part of this orchid. One year he could not find any plants, another year only a few stunted individuals, and another year many plants but all lacking flowers (sterile). Now, as he approaches age 90, he hopes to have the thrill of seeing the actual flowers some day in May.

A colony of Purple Five-leaved Orchid *(Isotria verticillata)* photographed at the only Missouri station known.

TWO COURSES IN BULB FORCING

Two courses in bulb forcing will be given at the Garden this fall, with Dr. Frederick G. Meyer as instructor. The new cool-storage greenhouses worked out very well last year, and those who took the course had excellent bulbs to take home. This year there will be an advanced course on new and rare bulbs which are seldom available in St. Louis.

As materials for the courses are purchased immediately after the closing registration date, no registration fees can be refunded after the last day of registration. Please send registration fees to:

Horticultural Courses,
Missouri Botanical Garden,
2315 Tower Grove Ave.,
St. Louis 10, Mo.

Course I—Bulb Forcing

Six sections (no prerequisites). Limited to 180 persons, 30 persons each section.

Registration: September 1–October 8.

Place: Experimental Greenhouse, Missouri Botanical Garden. Enter Cleveland Ave. gate, 2221 Tower Grove Ave.

When:

Week-day afternoon sections—1:30–4:00 P. M.

Monday, October 8
Wednesday, October 10
Friday, October 12
Wednesday, October 17

Saturday morning sections—9:30 A. M.–12:00 Noon, October 6 and October 27.

Content of Course:

Lecture on technique of bulb forcing

Hints on outdoor bulb culture

Five 7-inch bulb pans for each student

Tulips, narcissus, paperwhites, hyacinths

Each student receives at least 24 top quality bulbs

Planted bulbs will be given cold treatment in the Garden bulb pit and

cold greenhouse until ready to flower (approximately 60–80 days). Students will be notified by postcard when to pick up the bulbs.

Registration Fee—$5.00 (covers all materials)

Course II—Advanced Bulb Forcing

This course will feature new European introductions. All of them make charming and distinctive living-room ornaments. Registration is limited to 20 persons and is restricted to those who have taken the elementary bulb course in previous years.

Registration: September 15–October 13.

Place: Experimental Greenhouse, Missouri Botanical Garden. Enter Cleveland Avenue gate, 2221 Tower Grove Ave.

When: Saturday, October 13, 9:30 A. M.–12:00 Noon.

Content of Course:

To learn about forcing rare bulbs

Bulbs directly imported from Holland to be used

Ten pots of bulbs

Lachenalias, Sparaxis, Ixias, Tulip "Duc Van Tholl," Narcissus "Grand Soleil d'Or." (Two pots each kind).

Planted bulbs will be given cold treatment in the Garden cold greenhouse and bulb pit. Students will be notified by postcard when to pick up bulb pans.

Registration Fee—$10.00 (covers all materials)

THE LORE OF BASIL

There is something sinister about the lore of Basil. Pliny said the more the plant was abused the better it prospered and that it should be sown with curses. Since scorpions were seen to lie under its leaves it was thought that the plant bred them. Once, a man who smelled it was said to have had "a scorpion bred in the brain." There is a famous story from Boccaccio about a lady who placed the severed head of her murdered husband in a flower pot, planted Basil over it and watered it with her tears. The Basil thrived.

"Basil," some say, came from the Greek word "basilikon" meaning kingly, because it was fit for a king. Or it was derived from "basilisk," a fabulous creature which killed with a look.

In Greece the plant meant "hatred," possibly because of an old custom of representing poverty in paintings as an evil and ragged old woman seated beside a pot of Basil. In Italy, however, the plant if put in the shoes of one's enemy was supposed to turn his hatred to love. In Crete it meant "love washed with tears." In England, where it was used for warts and for indigestion, its seed was pounded fine and eaten "to procure a merrie hearte."

—Meredith Carson

RARE MISSOURI PLANTS—V

Umbrella Plant (Eriogonum longifolium)

JULIAN A. STEYERMARK

The only evidence for the occurrence of *Eriogonum longifolium* in Missouri was from an herbarium specimen which the writer encountered in the Drury College collection at Springfield, Missouri. This specimen was collected by Mr. J. W. Blankinship around 1890 from "Oregon County." Mr. Blankinship had made other remarkable finds in his years of collecting, especially in the region around Springfield. This Oregon County record remained as a challenge and no one since 1890 seemed to have been able to locate any other plants pertaining to this species.

Now Oregon County borders Arkansas, and the writer on several occasions tried to visit likely-looking spots where the Umbrella Plant might occur. As the species had been found from a number of places in Arkansas—dry cedar glades, rocky dry bluffs of the White River, and similar habitats—such types of areas were mapped out for exploration by the writer for Oregon County. But without any definite locality being indicated on the original label, trying to find the spot where *Eriogonum longifolium* existed in a county consisting of thousands of square miles was like searching for the proverbial "needle in a haystack." As the plant flowered during the hot summer months, it did not help matters any when repeated climbs and hikes over rocky "barrens" and "glades" under a broiling hot July or August sun failed to reveal any sign of an Umbrella Plant.

Then, in the spring of 1938, quite by accident, while I was engaged in making a survey in Ozark and Taney counties along rocky limestone bluffs of the White River to be flooded by the now-completed Bull Shoals Dam, I found the basal rosettes of leaves belonging to a plant which I did not recognize. The leaves were long and narrow, dull olive-green on the upper side and on the lower side covered with a dense, velvety, gray-white hairiness. In 1949 while I was occupied with another survey of the White River country, in order to rescue plant records from impending dam construction, I encountered additional basal leaf rosettes, like those which I had found eleven years earlier. I dug up a plant and transplanted it to the Ozark "glade" section of my wild flower garden in northern Illinois. Although the plant came through each winter, it did not flower. So the mystery of the basal rosette continued.

Finally, in 1953 I matched the basal rosettes of my herbarium specimens with—you guessed it—the basal leaves of the Umbrella Plant *(Eriogonum longifolium)*, and found that they agreed in every particular. The long-lost Umbrella Plant had been found. Now, all that remained was to return to the scene of the collection I had made in April and May of 1938 along the White River, and try to find the plant in flower.

Note the tall flowering stem of Umbrella Plant. Compare with height of lady (Mrs. Steyermark).

As the dates of flowering and fruiting recorded on herbarium sheets indicated the months of July through October, I planned my return visit for the Labor Day week-end of 1955. Accompanied by Mrs. Steyermark I revisited the Ozark County locality first. We set out with cameras and a field press. It had been seventeen years since I had been to this place. I did not know what to expect after such a long interval of time, because man's activities had destroyed so many other natural areas through burning, overgrazing, logging, and real estate or industrial development. Climbing over the rocky slopes above the Bull Shoals Lake, which now has flooded a considerable part of the area, it was discouraging to see so much overgrazed woodland and "glade" robbed of their natural cover. Then we climbed over a fence on the other side of which no grazing had been allowed, and the vegetation took on a natural appearance and became more abundant.

Now we entered a small limestone "glade" or opening above the rocky bluffs, dotted here and there with red cedar, chinquapin oak, and small shrubs. "Here it is," I shouted with enthusiasm, and soon, more and more plants were spotted. And what a pleasant surprise! The plants were flowering and the stems bearing the flowers were 5½ feet tall! An examination of the yellow-green flowers showed that each one had six calyx segments and nine stamens. Several little flowers were grouped together in bunches arising from a tiny cup (involucre), covered on the outside with grayish-white hairiness. The outside of the flowers themselves, as well as the flower-branches, had this gray-hairy covering. A few specimens were collected for distribution to the major herbaria of the United States, color notes recorded, and both kodachrome and black-and-white photographs made to perpetuate this noteworthy occasion.

As we trekked happily back to the car, another search had ended after a couple of decades, and the mystery of the basal leaf rosette had been solved. And another lost Missouri plant had been re-discovered!

Central portion of the main display of Bald Cypresses in Tower Grove Park. They are scattered through the east circle which is on the central east-west drive through the park, about a block and a half west of its Grand Avenue entrance. While beautiful at all times of year they are usually at their best during the month of October. There is also a fine planting of them in Francis Park. Through much younger, the trees have been well fed and have grown very rapidly.

BALD CYPRESSES FOR ST. LOUIS

EDGAR ANDERSON

THIS fall the Garden will again set out a considerable number of specimen trees of the Bald Cypress, *Taxodium distichum*. For over a year we have spent most of our efforts with the Garden's trees in getting rid of weed trees. These are such species as Tree-of-Heaven and Silver Maple which came up, mostly self-sown, during the years when St. Louis had a terrific smoke problem and such trees were not weeded out because they helped to fill up the gaps. Now that they have been taken out, there is room for something better and we are laying plans to put in some showy groups of Bald Cypress this fall, principally in the central part of the Garden near the big lily pools. It is certainly one of the finest trees for St. Louis; many of us think that for park and estate planting it is the best of all. Unfortunately, it is not always available in nurseries in the numbers and sizes one needs. This year it is in good supply and we plan to add considerably to our collection.

Not that the Garden does not already have many excellent specimens —every superintendent and Director we have had, since the days of Mr. Shaw's James Gurney a century ago, has set them out. Since they do well here and usually live to be very old we now have many handsome specimens. The most conspicuous are the towering pair set out to the rear of Mr. Henry Shaw's old country home TOWER GROVE. Others are set here and there throughout the grounds, and there is a fine collection at the Garden's Arboretum at Gray Summit, Missouri.

The Arboretum Cypresses are of more than passing interest. A former member of the Garden staff, Dr. Hermann Von Schrenk, took a special interest in the Bald Cypress and studied them throughout their range from southern Mexico to the coast of New Jersey. The collection at Gray Summit grew out of his efforts and has groups of trees from seeds collected in various parts of the natural range of the cypress including its westernmost limit near Kerrville, Texas. This Texas strain is of considerable botanical and horticultural impact. The trees are shorter and sturdier. Their bark is so much more resinous than the ordinary Bald Cypress that when they were young seedlings, just set out, they did not need a wire guard to protect them from rodent damage, as did the other strains.

The Garden's long interest in Bald Cypresses is directly responsible for a good many of the fine trees around St. Louis in addition to those in the Garden itself. At the turn of the century several of the families in the Compton Heights neighborhood (near Grand and Russell) had close connections with the Garden, and the numerous fine specimens of Bald Cypress in that part of town are lingering evidence of this interest in fine trees a half century ago.

The finest display of all, however, was started in the east circle of the central drive through Tower Grove

Park by Mr. Shaw's first superintendent, James Gurney. It has been cared for and added to by three generations of Gurney's, and is now certainly one of the handsomest plantings of Bald Cypresses anywhere in the world. It is charming in late spring when the trees leaf out in a ferny feathery brilliant light green. It is dramatic in a winter snow when the flagpole-straight trunks of the larger trees are more conspicuous than in summer. It is at its very best, however, in October when the cypresses turn from dark green to a green with a touch of gold and then, day after day, week after week, slowly turn from a brown yellow-green to a rich golden-brown. In years when we do not have a hard freeze too early, the nearby Ginkgoes turn a clear imperial yellow. The finest moment of all is those clear frosty mornings when the Ginkgo leaves first start to fall in the crisp quiet air, making round circles of a slightly tawny yellow under each Ginkgo while all the Cypresses are feathery spires of rich brown.

It is this unusual contrast of the delicate with the gigantic which gives the Bald Cypress its peculiar effect in the landscape. Its main outlines are bold. It matures slowly but lives to be an old tree, eventually dominated by the main trunk. Side branches are small and mostly delicate; the leaves are positively fern-like. Each leaf is a tiny, plain tongue of green an inch or so long; up to fifty of these leaves are arranged side by side on tiny twigs, most of which fall with the leaves, so that of all the conifers, none looks quite so much like a tall telephone pole hung with clustered ferns.

The Bald Cypress is indeed the most distinctive of our native American trees, and even to one who knows nothing of its botanical history it suggests something which really belongs to another world, as indeed it does. With its close relatives, the Sequoias of California, the Cryptomerias of Japan, and the Dawn Redwoods (Metasequoias) of China, it has persisted from times when trees of this sort were much more common in the world than they are today. The Cryptomerias, Redwoods, and Big-Trees are likewise gigantic towering trees with delicate, fern-like foliage. They too make dramatic avenues for parks and big estates in these parts of the world where they are winter-hardy enough to grow readily.

It is really surprising that of all these trees the Bald Cypress should do so well in a city park, because, unlike them, it is native only to swamps and overflow lands. The closely related Mexican Cypress grows in river-beds, not on river-banks, but down in the actual rocky bed of the stream itself. Our Bald Cypress grows in such places too, particularly in Texas, but it is more commonly found in bayous where there is water over its roots a good deal of the year. Under such conditions it does well, though its form usually becomes more rugged and picturesque than when it is grown as a lawn tree. Under these swamp conditions there are few other trees which can compete with it, and throughout the Gulf South, long winding lines of

Bald Cypress along the horizon mark the presence of the nearest bayous. In Mississippi and Louisiana one may drive for days along roads in the low country and never be out of sight of them. They extend from Texas to around the coast to New Jersey, running far up the coastal plains along the larger river systems. Below Cape Girardeau they are common in Missouri, though the vast stands which once characterized our "swampeastern" part of the state were greatly reduced when the land was cut-over and drained. Like many other southern species, they spread farther north along the Wabash than along the Mississippi itself. They are common in lower reaches of the Ohio, and from the mouth of the Wabash are found northwards to about the latitude of St. Louis.

As a specimen tree for the lawn, or set out in a park or large formal garden they do not need any more water than any other large tree. They do not like to be crowded and they prefer fertile soil, for they are strong feeders but north of their natural range they actually are better off in well-drained sites.

Chinese Flower Arrangement. By H. L. Li. 122 pp., 20 plates, 10 figs. Hedera House, Philadelphia. $4.00.

About the time the Pilgrims landed on the wild New England coast, a Chinese gentleman was writing a book on flower arrangement which is still a classic. He included references to Chang Ts'u, who wrote five centuries earlier on the twenty-six conditions most suitable for enjoying the blossoms of Japanese Apricots and made his own list of conditions for enjoying flowers in general. These included "wind among pines," "kettle sings deep in the night," and "an intimate friend arrives when flowers are in full bloom." Living in Peking (whose mid-continental dust storms eclipse those of our own dust bowl in frequency if not in intensity), he gave minute directions as to how flowers should be sprayed to keep them in good condition. To him flower arrangement was so much a matter of atmosphere that he even listed the kinds of people who should be intrusted with rinsing off various kinds of flowers! Chrysanthemums, he thought, should be cared for by one "who prefers everything that is old and extraordinary," crabapples by a charming guest, and peonies by a fashionable young lady. Two hundred years later, in the nineteenth century, another Chinese elegant was publishing a note-book which included a section on flower arrangement and bore the apt title, "Six chapters from a floating life." A modern Chinese scholar, Dr. Li, of the staff of the Morris Arboretum, includes all these and various other classics in his beautiful and sensitive book on Chinese flower arrangement. There are twenty full-page reproductions of Chinese prints and silk paintings of the 17th and 18th centuries, illustrating flower arrangements, as well as ten text-figures and a colored frontispiece. Dr. Li has supplied

a discussion of the ways flowers are used in Chinese homes, with notes about the actual flowers used and the symbolism which plays so large a part in their enjoyment. A translation of Chang Ch'ien-te's 1595 treatise on vase flowers is given in an appendix, along with an enumeration of common Chinese flowers and the Chinese dynasties with their dates. There are chapters on dwarf trees and other house plants and their use in Chinese homes, and the book has a good index.

All of this and more you will find in Dr. Li's book. Chinese flower arrangement has a literature extending over 900 years. In a little more than a hundred pages, Dr. Li manages to transmit to the American reader something of the atmosphere out of which this art arose, to induce even amidst American bustle a mingled sense of childlike wonder, studied casualness, and whimsical scholarship. It is a window into another kind of life and another attitude toward the plants around us. Lilyturfs (Liriope) growing in porcelain containers alongside weathered rocks of curious shape are presented to Chinese scholars, not only because they make an effective house plant but because the long narrow flat leaves are thought to be particularly appropriate as book-marks for ancient books. Pine, bamboo, and Japanese apricot are so traditionally mingled in winter bouquets that they have come to be commonly referred to as "Three friends of the cold season." Magnolia, crabapple, and peony flowers are given to one's friends because, in addition to making an effective arrangement in a basket, their names, strung together in Chinese, make a complicated pun. "Magnolia-crabapple-peony" said in Chinese, can also be taken to mean: "Wealth and honor in the halls of jade."

—E. A.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (spring to fall) and until six (in the winter time) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN

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COVER: Linnean House in the fall. Photograph by Martin Lammert III.

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Missouri Botanical Garden Bulletin

Vol. XLIV OCTOBER, 1956 No. 8

THE LINNEAN HOUSE

The Linnean House was built by Henry Shaw in 1881 and 1882 to house the palm collections and part of the floral displays. This is the only greenhouse remaining which was built and used by Mr. Shaw; and, although it has had many repairs over the years, the house is not greatly different from what it was in 1882. Receipts and ledger entries in the Garden's collection of Mr. Shaw's papers show that most of the work on this greenhouse was completed in 1881. By the summer of 1882 it was being used for plants; but it was not until June 22, 1883, that the marble busts of Linnaeus, Thomas Nuttall, and Asa Gray were unveiled and dedicated before members and guests of the American Association of Nurserymen, Florists and Seedsmen, then holding its annual convention in St. Louis. For many years this was the principal plant house in the Garden. Mr. Shaw must have planned to place other figures or ornamental features on the corners of the building and on the highest points of the ends, for into the centers of the stones at these points are cut holes for anchoring figures or ornaments. It is possible that vases or rounded stones similar to those used on so many buildings, walls, and posts throughout the Garden actually were installed, but so far no pictures have been found which show these in place and there are no receipts or entries in ledgers which refer to an additional six ornaments.

This summer the north half of the roof of the Linnean House was removed, all the wood sheathing replaced with redwood and treated lumber, the framework cleaned, treated and painted, new flashing and roofing applied, and glass installed. This was done with funds raised by the Garden Club of St. Louis during their Spring Garden Tour. It is hoped that next year this work will be continued and the decayed windows and frames replaced.

Usually the greatest splash of color can be found in the Linnean House in February when the camellias are in flower; but this year there will be an added show. Throughout November bright chrysanthemums will stand out in sharp contrast to the dark green leaves of the ivy, camellia, and the creeping fig which covers the north wall. —H. C. C.

IN MEMORIAM BENJAMIN MINGE DUGGAR

WORD has been received from the Lederle laboratories at Pearl River, New York, of the death of Dr. B. M. Duggar on September 10, at the age of 84, after a very short illness. Dr. Duggar is remembered at the Garden as the Plant Physiologist, in charge of the Graduate Laboratory of the Henry Shaw School of Botany from 1913 to 1927. He was an inspiring teacher and during his headship the School of Botany attained the prestige for which it has since been noted. Among the botanists who received their doctor's degrees under his tutelage at the Garden were: A. R. Davis, Henry Schmitz, J. Warren Severy, L. J. Klotz, R. A. Studhalter, Robert W. Webb, George M. Armstrong, Joanne Karrer Armstrong, S. M. Zeller, Takahashi Matsumoto, A. F. Camp, W. H. Chambers, G. W. Freiberg, P. L. Gainey, Grace Howard, D. C. Neal, Emery R. Ranker, Fanny Fern Smith Davis, H. C. Young.

In 1927 Dr. Duggar left St. Louis for the University of Wisconsin where a special Research Professorship had been created for him. In 1943 when he reached the retiring age he went on to the Lederle Laboratories where he played a leading role in the commercial development of the "wonder drug" aureomycin.

Dr. Duggar was a talented, many-sided person and during his long professional career he achieved distinction in more than one special field. He was intensely interested in the teaching not only of advanced students but of elementary botany classes and was author or co-author of various textbooks. As a young man he pioneered in the scientific breeding of mushrooms and as a kind of hobby wrote the standard book on mushroom growing. While at the Garden he developed and maintained a small business devoted to producing and selling high-grade mushroom spawn. Old-timers at the Garden remember this enterprise with affection because to produce mushroom spawn effectively one has to raise a lot of mushrooms. Dr. Duggar was not in the business of selling mushrooms and, since he was a most generous man, during those years every one from the janitor to the director enjoyed the surplus crop.

Though at the time it looked like a by-path, this experience stood Dr. Duggar in good stead when late in life he turned to the commercial production of antibiotics and was faced with the problem of growing various fungi in enormous quantities and as cheaply as possible.

Dr. Duggar and his family were active in the social life of the city and were widely known, yet in his day it was difficult to explain to the public just what he and his students were up to. The mushroom spawn business was understandable but that was just a sideline. With his students he was busy studying the physiology of fungi. Moulds, rots, mildews, rusts (and many a fungus so anonymous to the general public that one can find no common name to tag it with) were

grown in flasks and bottles. Their diet was scientifically regulated. Precise determinations were made of just what chemical substances they would feed on; and what they turned this food into was determined in so far as possible. Fungi are remarkable chemists; Dr. Duggar and his students took the lead in establishing that fact. Yet in those days it was almost impossible to make his various non-scientific friends understand that he was not just trying to learn how to prevent mildew or kill rusts or save man and his crops from the attacks of various micro-organisms. What he and his students were doing was basic research; they were trying to understand precisely how these organisms lived. Out of this effort have come such things as antibiotics and the various industrial uses of fungi; but even these advances are only by-products of the central effort he was making.

It is significant that even the august NEW YORK TIMES, which devoted two eight-inch columns to his obituary, never even mentioned what is probably his most important scientific work, his pioneer studies of virus. Are viruses disease germs or are they just a chemical substance? Dr. Duggar took the lead in establishing with precision something about their exact size and suggested that they were like an hereditary particle (a gene, perhaps) which had gone off on a career of its own. He was, you see, in his work with viruses, making a direct attack on the study of life itself, a study in which the Henry Shaw School of Botany is still playing a leading role. The farther a man is ahead of his fellows, the less are his efforts appreciated and understood. Dr. Duggar lived long enough for the people to understand some of the bearings of his work; but the central core of it is still beyond them—or at least beyond the NEW YORK TIMES, leader though it may be.

—EDGAR ANDERSON.

LATE OCTOBER FLOWERS IN MISSOURI

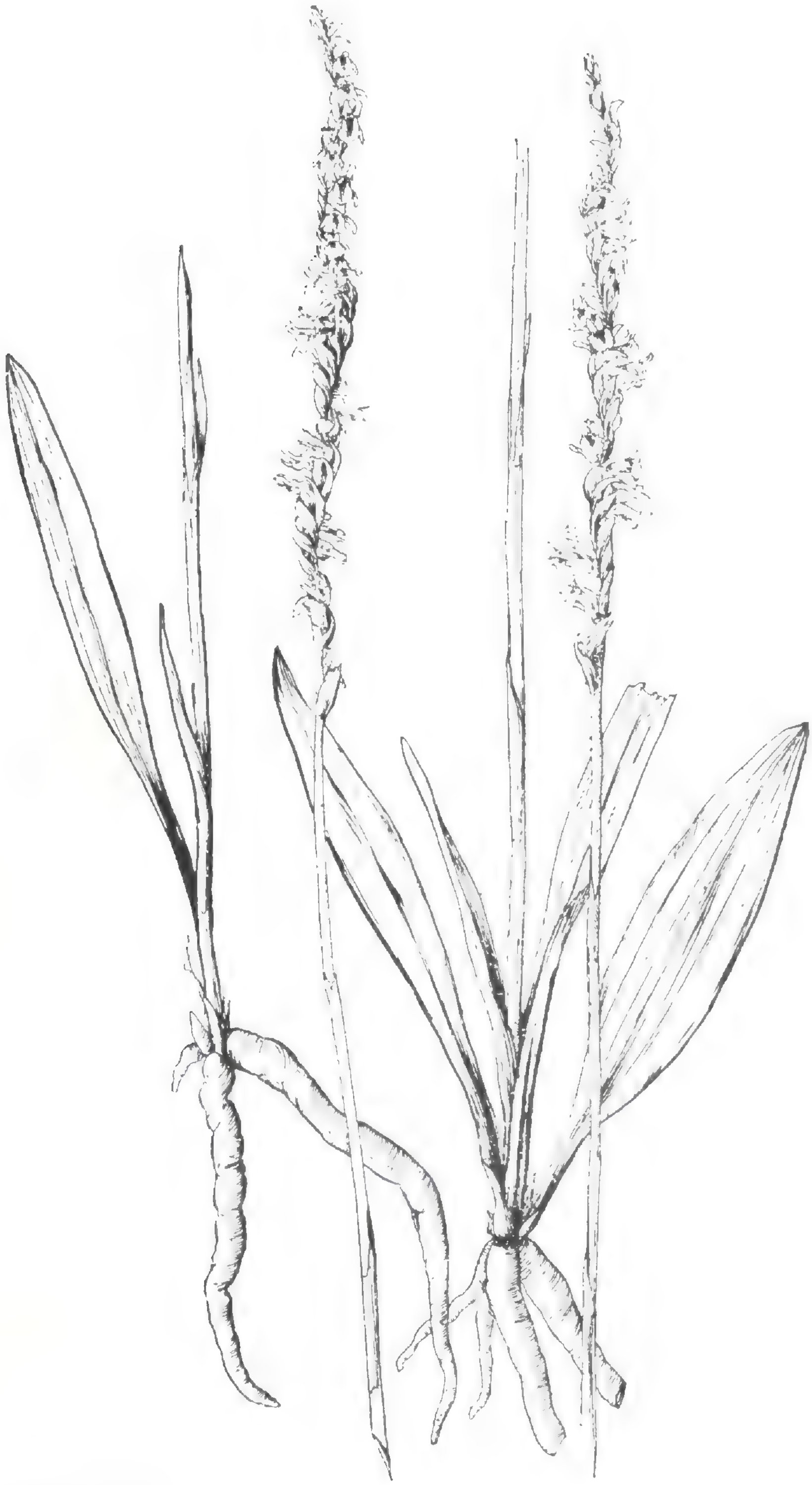
JULIAN STEYERMARK

THE latter half of October in Missouri is still a time for wild flowers. Not only do certain flowers normally blooming in the spring, such as False Garlic, Violet Wood Sorrel, and Birdfoot-Violet, put forth blossoms a second time, but the last shrub of the season, the Eastern Witch Hazel, is in full flower. The asters, goldenrods, and gentians cover the land with white, purple, blue, and yellow; and some Love-grasses (Eragrostis) and Hairgrass *(Muhlenbergia capillaris)* form rosy patches over the fields and rocky slopes. Altogether, one may find in bloom during the latter part of October as many as 196 different kinds of wild flowers in different sections of the state.

Over the hills, fields, and glades, members of many families, in addition to the well-represented Grass family, are conspicuous. Most outstanding, perhaps, are plants of the Sunflower family (Compositae), with its numerous asters, goldenrods, sunflowers and coneflowers, but also the Gentians (Gentianaceae) and Spurges (Euphorbiaceae) are well represented. Even members of the Mustard family (Cruciferae), Orchid family (Orchidaceae), Mallow family (Malvaceae), Violet family (Violaceae), Morning-glory family (Convolvulaceae), Pea family (Leguminosae), and several others, including the late-flowering members of the Lily family such as False Garlic (Nothoscordum) and Wild Onion *(Allium stellatum)*, are to be found in late October.

While the species included in the following list represent the majority of those likely to be found in any year in Missouri during the latter half of October, others could be added that are stragglers of earlier-blooming species, and in some exceptional years it is possible to add still others.

Pondweed *(Potamogeton illinoensis)*
Love-grass *(Eragrostis spectabilis)*
Tall Red-top *(Triodia flava, T. elongata, T. stricta)*
Drop-seed *(Sporobolus neglectus, S. canovirens, S. asper)*
Northern Drop-seed *(Sporobolus heterolepsis)*
Poverty-Grass *(Sporobolus vaginiflorus)*
Thingrass *(Agrostis perennans* v. *aestivalis)*
Nimble Will *(Muhlenbergia Schreberi)*
Muhly Grass *(Muhlenbergia sobolifera, M. tenuiflora, M. cuspidata, M. mexicana, M. brachyphylla, M. frondosa, M. racemosa)*
Hairgrass *(M. capillaris)*
Triple-awned Grass *(Aristida oligantha, A. purpurascens)*
Poverty-Grass *(Aristida dichotoma, A. longespica)*
Beardgrass *(Andropogon Gerardi)*
Bluestem *(A. scoparius)*
Broom-sedge *(A. virginicus, A. Elliottii)*
Indian Grass *(Sorghastrum nutans)*
Yellow Nut-grass *(Cyperus esculentus)*
Dayflower *(Commelina diffusa)*
Wild Onion *(Allium stellatum)*
False Garlic *(Nothoscordum bivalve)*
Nodding Pogonia *(Triphora trianthophora)*
Ladies'-tresses *(Spiranthes cernua)*
Nettle *(Urtica procera)*
Yellow Cress *(Rorippa sinuata, R. sessiliflora, R. islandica* v. *hispida)*
Creeping Yellow Cress *(R. sylvestris)*
Watercress *(Nasturtium officinale)*
Alumroot *(Heuchera puberula)*
Grass-of-Parnassus *(Parnassia grandifolia)*
Eastern Witch-hazel *(Hamamelis virginiana)*
Partridge-Pea *(Cassia fasciculata, C. nictitans)*
Red Clover *(Trifolium pratense)*
White Clover *(Trifolium repens)*
Tick-trefoil *(Desmodium ciliare, D. marilandicum, D. paniculatum, D. perplexum, D. sessilifolium)*
Bush-clover *(Lespedeza virginica)*
Yellow Flax *(Linum sulcatum)*
Yellow Wood-Sorrel *(Oxalis europaea, O. stricta)*



Blanche Ames del

Ladies' Tresses

Violet Wood-Sorrel *(O. violacea)*
Croton *(Croton glandulosus* v. *septentrionalis, C. capitatus, C. monanthogynus)*
Three-seeded Mercury *(Acalypha gracilens* v. *monococca, A. rhomboidea, A. virginica)*
Nettle-leaved Tragia *(Tragia urticifolia)*
Painted-leaf *(Euphorbia heterophylla)*
Spurge *(Euphorbia dentata)*
Milk-purslane *(Euphorbia supina)*
Creeping Spurge *(Euphorbia serpens)*
Yellow False Mallow *(Sphaeralcea angusta)*
Prickly Mallow *(Sida spinosa)*
Rose-Mallow *(Hibiscus lasiocarpus)*
St. Andrew's Cross *(Ascyrum hypericoides)*
St. John's-wort *(Hypericum mutilum, H. gymnathum, H. Drummondii)*
Pansy-Violet or Birdfoot-Violet *(Viola pedata)*
Common Blue Violet *(Viola papilionacea)*
Water-purslane *(Ludwigia palustris* v. *americana)*
Evening-Primrose *(Oenothera biennis* v. *pycnocarpa)*
Gaura *(Gaura biennis)*
Queen Anne's-lace *(Daucus Carota)*
Stiff Gentian *(Gentiana quinquefolia* v. *occidentalis)*
Downy Gentian *(Gentiana puberula)*
Closed Gentian *(Gentiana Andrewsii, G. clausa)*
Yellowish Gentian *(Gentiana flavida)*
Morning-glory *(Ipomoea lacunosa)*
Love-vine *(Cuscuta Polygonorum, C. Cephalanthi, C. campestris, C. Gronovii, C. glomerata, C. compacta)*
Fall-Phlox *(Phlox paniculata)*
Heliotrope *(Heliotropium tenellum)*
Turn-sole *(Heliotropium indicum)*
False Pennyroyal *(Isanthus brachiatus)*
Bluecurls *(Trichostema dichotomum)*
Selfheal *(Prunella vulgaris* v. *lanceolata)*
False Dragonhead *(Physostegia virginiana)*
Dittany *(Cunila origanoides)*
Ground-cherry *(Physalis pubescens, P. subglabrata)*
Jimsonweed *(Datura Stramonium)*
Conobea multifida
False Pimpernel *(Lindernia dubia)*
Gerardia *(Gerardia tenuifolia, G. Gattingeri)*
Lousewort *(Pedicularis lanceolata)*
Ruellia *(Ruellia humilis)*
Buttonweed *(Diodia teres)*
Houstonia *(Houstonia nigricans)*
Hedyotis *(Hedyotis Boscii)*
Bur-Cucumber *(Sicyos angulatus)*
Tall Bellflower *(Campanula americana)*
Ironweed *(Vernonia crinita)*
Elephant's-foot *(Elephantopus carolinianus)*
Brickellia *(Brickellia grandiflora)*
False Boneset *(Kuhnia eupatorioides* v. *angustifolia)*
Gumweed *(Grindelia lanceolata)*
Broom-Snakeroot *(Gutierrezia dracunculoides)*
Golden Aster *(Chrysopsis camporum)*
Blue-stem Goldenrod *(Solidago caesia)*
Goldenrod *(S. altissima, S. arguta, S. Buckleyi, S. Drummondii, S. flexicaulis, S. Gattingeri, S. graminifolia, S. gymnospermoides, S. bispida, S. nemoralis, S. patula, S. petiolaris* and v. *Wardii, S. radula, S. rugosa, S. speciosa* v. *angustata, S. ulmifolia)*
Aster *(Aster anomalus, A. azureus, A. cordifolius, A. ericoides, A. laevis, A. lateriflorus, A. linariifolius, A. novae-angliae, A. oblongifolius, A. patens, A. pilosus* and v. *demotus, A. praealtus, A. puniceus* v. *firmus* f. *lucidulus, A. sagittifolius* and v. *Drummondii, A. sericeus, A. simplex, A. turbinellus, A. vimineus* v. *subdumosus)*
Everlasting *(Gnaphalius obtusifolium)*
Ragweed *(Ambrosia bidentata)*
Cocklebur *(Xanthium pensylvanicum, X. chinense)*
Leafcup *(Polymnia canadensis)*
Rosinweed *(Silphium integrifolium)*
Cup-plant *(S. perfoliatum)*
Prairie-Dock *(S. terebinthinaceum)*
Yerba-de-Tago *(Eclipta alba)*
Coneflower *(Rudbeckia missouriensis, R. triloba, R. umbrosa)*
Sunflower *(Helianthus grosseserratus, H. hirsutus, H. Maximiliani, H. tuberosus)*
Crown-beard *(Verbesina virginica)*
Stick-tight *(Bidens cernua, B. connata, B. discoidea)*
Galinsoga *(Galinsoga ciliata, G. parviflora)*
Palafoxia *(Palafoxia callosa)*
Sneezeweed *(Helenium autumnale, H. nudiflorum, H. tenuifolium)*
Fetid Marigold *(Dyssodia papposa)*
Western Mugwort *(Artemisia ludoviciana* v. *mexicana, A. ludoviciana* v. *gnaphalodes)*
Fireweed *(Erechtites hieracifolia* v. *intermedia)*
Thistle *(Cirsium altissimum)*
Chicory *(Cichorium Intybus)*
Dandelion *(Taraxacum erythrospermum, T. officinale)*
Wild Lettuce *(Lactuca floridana)*
False Dandelion *(Pyrrhopappus carolinianus)*
Rattlesnake-root *(Prenanthes altissima* v. *cinnamomea)*
Hawkweed *(Hieracium Gronovii)*

In this group are found 18 kinds of aster, 17 of goldenrod, four of sunflower, five of tick-trefoil, six of love-vine, and five of gentian, and at least 29 different kinds of grasses. Of the late-flowering grasses, the most conspicuous ones are Muhly Grass, Triple-awn Grass, Drop-seed, and Broomsedge or Bluestem.

ROSE OF BRODY: AN OUTSTANDING NEW DAFFODIL

EDGAR ANDERSON

WHETHER you like to call them "pink" or not, the new varieties of daffodils like *Narcissus* MRS. R. O. BACKHOUSE in coloring are a great addition to the spring flower border. Pink really isn't the word, nor could any one word be found. Part of their charm is that all of them open one shade and then slowly change to another. Sometimes they are almost the color of a muskmelon, sometimes an off-white with a faint wash of ecru, a sort of fading grayish pink. Their color varies with the season and with the part of the world where they are being grown. In all of them which I have seen, the yellow or apricot tone is strongest when they open, and the pink (if we may call it that) gets noticeably stronger as the yellow fades away. Their greatest beauty is shown when three flowers which opened on three successive days are in bloom side-by-side producing a whole series of subtle shadings.

For all their charm of color, few of these pink daffodils are really pleasing in form. The first varieties to appear were raggedy by show standards, and most of the newer hybrids have the same set of faults—floppy narrow petals, an irregular pinched look in the trumpet, a sort of general air of a beautiful flower made of wax which had softened a little and lost its perfection of line. With ROSE OF BRODY all this is changed. It would be a good variety even if it were not pink. The flower is large, the perianth segments are wide, the cup of the trumpet is flaring and beautifully formed. One only wishes that there would be cool, wet weather *every* spring to keep the clear lovely tint on the inside of the cup to its full perfection. The trumpet is wide enough to see into. Looking straight down into it is like looking into an exquisite vase of milk-white glass, delicately colored on the inside and deepening in tone toward the base.

ROSE OF BRODY is a new introduction and I suppose a horribly expensive variety in this year's catalogues. Fortunately, my bulbs were given to me by a fellow Narcissus fancier. I am happy to report that with me, at least, the variety is a "good do-er". It grows readily and increases well. The price should come down in a few years' time.

ROSE OF BRODY

THE MISSOURI BOTANICAL GARDEN HERBARIUM

JOHN D. DWYER

WHEN we read about explorers ascending the snow-studded peaks of the Himalayas or descending to the floor of the dark and voiceless ocean, we are often tricked into forgetting about the serious objectives of most scientific expeditions, so vivid are the word-pictures of the author. If there is a botanist in the expedition, he will be studying the plant life, perhaps picking the snow-clad aconite from a mountain slope, or snatching the gelatinous seaweed from the ocean. These he will carefully press and dry. The author describing the adventure, no doubt, will refer to the hardships involved in the collection and the importance of the plants, but usually he will give little information as to the destiny of the material being gathered.

For an answer to the fate of such materials collected we find ourselves in the Administration Building of the Missouri Botanical Garden. A faint odor of paradichlorobenzene, so commonly used as an insect repellent in clothes closets, may serve as the first clue to the fact that this building is a treasure house of preserved botanical material; in fact it houses one of the largest collections in the United States, and, for that matter, one of the largest in the world. In addition it contains the library and the offices of many staff members and personnel. It is to such places as this in botanical institutions all over the world that most plant specimens, whether collected on mountain, in tropical rain forest, on Arctic tundra, or in a waste-lot in the railroad yards of St. Louis, are ultimately traceable.

If we take the elevator to the second and third floors where the plant collections are stored, the odor of paradichlorobenzene becomes stronger. Yet no specimens may be in sight! Steel cabinets about 7 feet high, arranged in rows, occupy much of the floor space. Upon opening one of the cabinet doors we are confronted with shelves of manila folders each bearing a scientific name. If we examine a sheet of paper (slightly smaller than a folded newspaper) in the folder marked, for instance, Aconitum (a plant of the Buttercup family commonly called Monkshood), we may find the preserved plant which once flourished in the melting montane snows. On the label in the corner of the sheet will be the details of the collection: the scientific name of the plant, the habitat in which the plant grew, the collector's name, etc.

When the botanist on the alpine slope carefully placed his living specimen between blotters to be pressed and dried, his reasons for collecting it may have been several. Perhaps, as a specialist on the aconites he sought additional material for study in the preparation of a monograph (descriptions of the species which make up a plant group and their arrangement according to relationships). Perhaps, on the other hand, he wished to furnish the biochemist in distant New

Jersey, studying the powerful alkaloids from the roots of the aconite, with the name of the particular species which is so fruitful in its yield of the drug. Perhaps he felt the urge to add another species to the ever-expanding horizon of the biological world.

Wandering through the maze of cabinets we conclude that there must be a great number of specimens in the herbarium (a collection of dried and preserved plant specimens arranged in an orderly fashion for scientific study). In the Missouri Botanical Garden Herbarium there are approximately one and one-half million specimens. These are grouped, with other specimens to which they are obviously closely related, into distinct plant families (e. g. the Rose family, the Orchid family) which are filed in the cabinets in systematic order ranging from the simplest to the most complex plant forms. A plant brought into the herbarium for identification is first classified into its family by the use of reference works, then compared with the specimens in that family for determination of its generic and specific name. Success in using this method is, of course, dependent upon the degree to which the herbarium is representative of all plant species.

The early history of the herbarium in Shaw's Garden helps to explain the magnitude of the collections. In examining numerous sheets from various cabinets, for example, we may note the label "Bernhardi Herbarium" stamped thereon. In 1857 Dr. Engelmann, the eminent botanist and first curator of the herbarium, was commissioned by Mr. Shaw to purchase dried specimens from the equally distinguished botanist, Prof. John J. Bernhardi of Erfurt, Germany. Bernhardi had amassed a large herbarium by exchange or by purchase of plants from botanists and collectors active in most areas of the world. In bringing many of the Bernhardi specimens to St. Louis, as well as in purchasing books to establish a library, Dr. Engelmann laid the foundations for the then-infant Missouri Botanical Garden as a center of research in systematic botany and related fields.

Dr. Engelmann in his lifetime amassed a private herbarium of over 100,000 specimens. These included important collections made by numerous botanists from 1838 to 1880, principally in many sections of the United States then virtually unknown from a floristic viewpoint. In 1889 Dr. Engelmann's son presented this priceless collection to the herbarium of Shaw's Garden.

Obviously, such a large herbarium demands expert care and constant attention. Dr. George B. Van Schaack, Acting Curator of the Herbarium, in addition to his curatorial duties, must provide for the handling and filing of new accessions of specimens. Special attention must be given to type specimens or plants on which the authors of new species or varieties based their descriptions. These specimens, in special folders identifiable by a conspicuous red edging, are an important source of reference for botanists attempting to interpret the original description and concept of the species. To offset the lack of many type speci-

mens a large collection of photographs of types found in other herbaria is maintained.

The value of an herbarium is to be estimated not only by the numbers of specimens on deposit but also by the use being made of them. Perhaps your first clue to the activity of the Garden in this respect would be the large packages frequently seen at the front entrance of the Administration Building, addressed to herbaria in Europe, England, China, or perhaps to a little-known college in Pennsylvania. For dried specimens are sent on loan to scientific institutions throughout the World, including those behind the Iron Curtain. In the herbarium itself, botanists from all parts of the United States and occasionally from abroad, avail themselves of the opportunity to study the priceless collections. Frequently their visits extend over periods of weeks or months.

In the herbarium and adjacent offices staff members and graduate students from Washington University are at work on problems involving the nomenclature, classification, and evolution of plant groups. Dr. Robert Woodson, Senior Taxonomist, an authority on the Milkweed family, and Dr. Rolla Tryon, Associate Curator, a specialist on ferns, are among the well-known staff members. Their training of graduate students serves to perpetuate the heritage of a science which is absolutely essential to botanical and scientific progress. Many prominent American taxonomists received their early training at the Missouri Botanical Garden and Washington University. Through the pages of THE ANNALS OF THE MISSOURI BOTANICAL GARDEN and similar journals, as well as by teaching and lecturing, they have advanced the knowledge of plant systematics. There is scarcely a university or botanical garden that has not felt the impact of the botanical work of Shaw's Garden.

Of great importance to the herbarium is the large collection of living species maintained at Shaw's Garden and at Gray Summit. A student, armed with the knowledge of the morphology of a species gained from a study of herbarium material, is in far better position to appreciate the dynamics of development as well as the range of variability of plants in the living state. Some features important to identification of the species are often difficult to study or are not retained by the dried material and are thus best observed in the living plant. Then, too, in the modern concept of the plant species, in which it is interpreted and defined in terms of a community of living and interbreeding plants, greater emphasis is being placed on the detailed study of many living plants from a large experimental population rather than of dried specimens collected at random.

This newer approach to the definition of the species in no sense lessens the value of the herbarium for it represents the historical record of the world population of plants, and the student of the plant community will continue to add specimens to it as evidence of the observations made in the field or in the experimental garden.

The herbarium, in serving all of the plant sciences, plays an integral role in the progress of science inasmuch as the problems of botany are a segment of the maze of problems in science today. Not only is it the tool of the taxonomist in solving the intricate problems of nomenclature, classification, and evolution of plants, but it also serves other botanists, horticulturists, and gardeners who must fall back upon the taxonomist and his herbarium for the specific names of plants. In the vast scheme of scientific advancement, the herbarium plays an important part, even though its role may not be fully appreciated.

If we pause for a moment before leaving the herbarium, perhaps we can sense the drama hidden in the neat piles of herbarium sheets. While lifeless and usually drab in comparison with the living, these plants represent the labors of countless workers and collectors for more than 200 years. It is difficult to imagine that one specimen may have been collected in the shadow of an Indian tomahawk, or another snatched by a quivering hand from a rock precipice in the Andes, or another from the icy rocks of Greenland. It was the enthusiasm of such workers that filled these cases.

Book Review:—

Tree and Shrubs of the Upper Midwest. By C. O. Rosendahl. 411 pp., 260 figs. University of Minnesota Press, Minneapolis. 1955. Price $6.00.

The woody plants, because of the economic importance of the group, have always received their full share of attention by botanical authors. The present treatment will be welcomed for it not only provides adequate means for identification but also notes on the distribution, hardiness and habitat preferences of the species. The inclusion of the commonly cultivated, as well as the native species, gives it a greater scope than the usual book of its kind and will make it an especially useful reference for problems in landscaping.

There are keys and descriptions for each of the some 350 species and excellent illustrations for most of them. The technical terminology has been simplified and there is a glossary of the necessary terms. Most of those that apply to the leaves are illustrated. Any person interested in plants will certainly have no difficulty in using the book.

This is an enlarged and revised edition of the long out-of-print "Trees and Shrubs of Minnesota," and the University of Minnesota Press is to be congratulated on this continuation of their fine series of publications in Natural History.

—A. F. T.

KOREAN LESPEDEZA: OZARK GOLD

FEW people outside the field of agriculture are familiar or interested in Lespedeza. This weedy little plant is practically unknown to urbanites. Although this plant never ventures far enough into the city to become a troublesome weed nor produces flowers large enough to be of horticultural significance, most city dwellers at one time or another have surely seen it, because it grows in great profusion along many highways and roadways of middle America.

Seven out of ten persons in St. Louis, by actual survey, have never heard the name Lespedeza. Two out of ten know it as a plant, and only one person out of ten, all farmers or farmophiles, knows anything more than its name. In spite of its obscurity, this legume has been one of the major factors in the advancement of agriculture in this section of the United States.

Perhaps one of the reasons why Korean Lespedeza is so little known is because of its ugly and ordinary appearance after it is frosted. Not even the most enthusiastic naturalist could claim that it is beautiful in the winter landscape. Early in the autumn most of the leaves drop off, the few remaining turn a gray-brown and shrivel up, and the slender stems lose most of their color. There are so many stems, set so close together, that they give the general impression of old worn scrubbing brushes, scattered bristle-like throughout the fields and along the roadsides.

Credit for its introduction from Korea is given to the United States Department of Agriculture. It was introduced into the southern states in 1919, and gradually spread northward until today it is found in the southern part of Canada. Its natural and artificial spreading ability can be readily shown by its acreage figure; 349,000 acres being planted in 1929, as compared to 7,000,000 acres in 1946.

Since the original introduction of Korean Lespedeza, new varieties have been bred and imported. Plant breeders have extended the climatic range and soil tolerance to the extent that today it is seen in many locations where other forage and hay crops refuse to grow. Being an excellent crop in a half dozen ways, there is nothing spectacular about the spread of Korean Lespedeza.

Unlike Alfalfa, its lush but demanding cousin, Lespedeza does not require rich alluvial soil. Barren hillsides support Lespedeza; but of course it grows better on richer soil. On poor soils it also serves as a good erosion checker. Highway departments have seeded road cuts with this short stubby legume in order to prevent washing.

As a hay crop, Lespedeza ranks quite close in many ways to Alfalfa. In protein content it is superior. For this reason many farmers prefer it to Alfalfa. Many farmers also say that its keeping quality is much better than Alfalfa. It is valuable for increasing the available nitrogen of the soil

through solid crop rotation procedures, and frequently as a green manure crop it is plowed under in the field. Usually only one hay crop is taken each year. The field is then allowed to grow and produce seeds again. In this fashion the plant reseeds itself and only sparse plantings will be required the following year.

In the northern Ozarks, where Korean Lespedeza is seldom planted as a clean crop, it nearly always has a patchy appearance. It will show up in late fall pastures as little bristly bunches of red-brown or gray-brown stems, from three inches to a foot or more high. One of the easiest places to learn to recognize it is along the side of new highways where little else will grow. In such places it may line the roads for hundreds of feet, or even for several miles—in summer a mat of dark green rather cloverish leaves; in winter, dark red-brown masses of bare stems. For long stretches these masses may be only a few inches wide next to the pavement edge, broadening out to several feet when the road goes through more of a cut where the red soil is exposed.

In many places these little patches of Lespedeza persist in practically the same spots year after year. If one examines them in early spring, he will find that many of the seeds have sprouted in the shade of the mother plants. They grow slowly for some weeks and not until summer is really here do they grow up above the shelter of the old, dead skeletons of last year's plants. The form and size of Korean Lespedeza are tremendously affected by the place in which it grows. On poor soils and in dry situations it may be only two or three inches high. Single plants sometimes come up here and there on the gravel bars of Ozark rivers. When one of these is absolutely isolated from all other plants it may grow out side-wise instead of upwards and form a flattish little mat a foot or so wide, but less than an inch high.

A plant which is adding tons of available protein to the sterile hillsides of the Ozarks is worth examining more closely. Let us take one of these frayed-out branch ends and put it under the microscope, or look at it with a hand-lens. Seen in this way it has its own charm of line, if not of color, and one can find some pleasure in working out the ultimate pattern in which these simple seed pods are set upon the plant.

As the tip of the stem is approached the internodes get progressively shorter in an harmoniously rhythmic sequence. Along one side of each node, just below the next joint, is a tiny comb of curved hairs, one of the easiest characters by which to distinguish the Korean Lespedeza from its close relative, the Japanese Lespedeza. At each joint are two tiny leaves or bracts, which weather to whitish gray by late winter. Rising from beneath the bracts are the delicately formed stalks on which the seed-pods are borne, one stalk to each pod with usually two such stalks at each joint. The seed-pod is a delicate little urn a little larger than the head of an ordinary pin, made up of two tightly clasping halves which can be forced apart to

reveal the small shiny brown seed within.

If one pulls up a few of these plants and examines them carefully they take on a little more interest if not much added charm. The tiny hard stems are about the size and texture of stiff broom straws. Near their tips they feather out into bunches of gray, dry bracts among which many of the seed-pods remain all winter. It is these tiny seed-pods, each with its pin-point pill of protein, which make the Lespedeza so important to game birds and other wild life.—*(From a report prepared by Dr. Anderson's class in field botany.)*

Book Reviews:—

Cactus Guide. By Ladislaus Cutak. 144 pp., 18 pp. illustrations. Van Nostrand Co. Princeton, N. J. Price $3.95.

To Lad Cutak cacti are the most beautiful and the most fascinating flowers on earth, and the remarkable thing about his *Cactus Guide* is that he is able to impart that feeling to the reader. After laying down his book one is left with the wonder that every gardener does not grow cactus. In the greenhouses at the Missouri Botanical Garden, where Lad has worked since he was a young boy, he was exposed to many rare and beautiful plants but he chose the cactus as his love and the object of his enthusiastic attentions. Their variety, their beauty, their grotesqueness fascinated him, and what's more they were "the easiest of all house plants to grow."

The book is written for the amateur, and when a technical word has to be used, Cutak defines it clearly or illustrates it with a drawing. The drawings, for which he has a special aptitude, are often more expressive than a lot of words would have been. He includes a whole chapter to tell you what a cactus is and another on varieties. The care and propagating of cacti are made simple provided that you have digested the first part of the book, and know what kind of cactus you have. In the chapter on uses of cacti we learn that they are nearly as various as the plants themselves. They make wonderful glass gardens ("desertariums") when planted in Wardian cases; they are good in dish gardens, or in pots or novelty containers on windowsills; and they may even be planted on buttons. In flower arrangements they are quite effective, leaves of aloes or sansevierias being used as a background and the rosettes of hen-and-chickens or mamillarias for focal points. Planted outdoors, they are very much at home in rock gardens or against a wall in a sunny location.

For the cactus enthusiast who would like to associate himself with a group, a list of cactus societies or clubs, with

their locations, is given at the end of the book.

Lad tells us that when his enthusiasm began to get the better of him there weren't too many cactus books written in English, and he had to diligently make his own observations. "It was difficult to cram into a short book everything that he had learned," he says, but the reader feels that he has made a very good job if it.

—NELL C. HORNER

A B C of Orchid Growing. By John V. Watkins. 190 pp., 45 pls., 4 figs., 2 tables, 1 color pl. Prentice-Hall, Inc., Englewood Cliffs, N. J. $3.50.

A VERY handy little book, chock full of valuable information! Particularly useful is the "Orchid Growers' Reference Table" printed on the end-sheets. This charts, in easy-to-read form, bloom time, when to pot, potting medium, minimum temperatures, amount of light, and when to fertilize twenty-five popular kinds of orchids. The author obviously has had immense personal experience with orchids, and, in addition, has drawn on the experience of many famous growers in preparing his text. A large number of black-and-white plates illustrate the book. Mr. Watkins is not ready to admit that orchid growing is easy to accomplish in the home, without greenhouse conditions. In his preface he says: "There has been a tendency for some writers to oversimplify orchid growing. Could these spinners of glamour tales be folks who never grew a greenhouse full of orchids through the years single-handed? This is now, and always has been, a time-consuming, painstaking pursuit—one chosen by thousands as a rewarding hobby."

Despite this insistence that growing orchids is difficult, the author then plunges into a text which is worded so that even the rawest beginner can grasp what is said, and he then proceeds to prove to his readers how very easy it really is to grow most orchids.

This is a book for everyone interested in orchids. The beginner will find in it answers to the most elementary of questions. The advanced hobbyist will find gathered here information long sought after, but seldom found in such understandable form. Even the experienced grower will want to pick up the book again and again, to reread some of the more technical passages, which reflect a great perception of the many problems involved in managing a large greenhouse.

Though you may have numerous books in your orchid library, this one is distinctly worth while adding.

—W. F. SCOTT

PLANTS FOR A HOT PLACE NEAR A WALL

Robert Frost began one of his best known poems with the line "Something there is that doesn't love a wall" and I frequently think of it as I struggle with the small portion of my garden which is located between the stone house in which I live and the high stone boundary wall twenty feet away. During the morning there is little shade, the sun pours in and it is always blistering hot by noon in summer time, then all the afternoon it is sunless. Anything which does really well there is going to have to relish heat. So far the only things which have been really happy under these conditions are Lantana (in various colors), Vetiver Perfume Grass, old-fashioned small-flowered cannas, Snow-on-the-Mountain and Beefsteak Plant (Perilla). These last two are coarse, almost weedy, annuals but the one is a gray-green and white, the other a dark red and a green which is almost black. Grown next to each other they form a beautiful contrast; neither is too strong a neighbor, and in combination they look almost elegant. Vetiver Grass is not hardy here, and one has to buy roots of it somewhere in the south. However, it travels easily in the mail, grows rapidly as soon as the hot weather begins, and gets up to eight to ten feet if planted in a sheltered sunny nook. The white crinkled roots have a delightful fragrance and when washed and dried can be used like lavender in scenting linen closets or in making sachets.

—E. A.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (spring to fall) and until six (in the winter time) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

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COVER:—Swift rapid or gravel run leads down into a long deep pool. At Jack's Fork. Photo by Leonard Hall.

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Missouri Botanical Garden Bulletin

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THE OZARKS COME BACK

(Continued from January, 1956 BULLETIN*)*

LEONARD HALL, Possum Trot Farm

ONE of the great problems we face in bringing about total rehabilitation of the forested lands of the Ozarks and in putting them into profitable sustained-yield production has to do with open range grazing. This is the custom, sanctioned by law in the open range counties, of allowing any farmer to turn out his cattle, hogs, horses, mules and goats to forage on forested land which is not only privately owned but belongs to some one else. The custom dates back, of course, to a day when most wild land had not been taken up by private owners. Because it enables the small marginal farmer to run many more animals than his own deeded land can support, the custom dies hard.

There are many reasons why open range grazing, which almost always means over-grazing, is destructive. The one most often noted is that it causes great damage to young trees, practically eliminating all tree reproduction. But there are other reasons equally important, and some of these are sociological and physiological. Open range grazing breeds a kind of lawlessness by the very fact of sanctioning by law the right of a minority group to exploit for profit the property of another group who is denied redress for damages sustained. It encourages sub-marginal farming and sub-marginal living in many Ozark counties. It goes hand-in-hand with incendiary fire-setting ("we burn to make the grass grow"), and the fires inhibit tree reproduction, damage the growing and mature timber, cause erosion, and destroy wildlife.

These are the facts about open range grazing—although they do not mean that a good many responsible and respectable citizens do not also use the open range. Many Ozark counties, however, have already found it profitable to pass county-wide stock laws which eliminate open range grazing entirely. Others have started to close the range, one township at a time. But in the counties with the largest forest acreage and the fewest agricultural resources, stock laws go down to defeat in every election, despite the fact that

potential forest income is far greater than the actual livestock income. The answer to the problem is probably a state-wide law which will come into being when enough people have been killed by running into livestock on Ozark highways.

In our Missouri national forests, the Forest Service has instituted a control program in most areas where grazing pressure was excessive. As a result of this program the actual amount of good forest grazing, measured in pounds of meat per section of land per year, has increased. Timber reproduction and growth have improved. Wildlife populations have made a tremendous recovery. Finally, by means of a program encouraging farmers to improve their home pastures and hay lands, agricultural income in areas contiguous to the forest has probably been increased—while many poor, sub-marginal holdings have been closed out to the benefit of all concerned.

Most of the steps which make for better forest management—especially control of fire and grazing and improvement of timber stand—are also beneficial to wildlife. And, fortunately for the people of Missouri and for the flora and fauna involved, both the U. S. Forest Service and our own Conservation Commission have had wildlife as a primary interest. Thus in the early days of the program, back in the mid-1930's, cooperative wildlife refuges were set aside in our national forests in an effort to increase the numbers of whitetail deer, wild turkey and other birds, and small mammals. In these refuges the Forest Service worked to manage and improve the land as a habitat for wildlife, while the Conservation Commission assumed responsibility for protection and management of the wildlife itself.

Many things have followed from this small beginning; and as more and more forest land in the state comes under good management, the area which will support wildlife populations increases steadily. Most spectacular of all has been the come-back of the whitetail deer. Back in 1934 when Drs. Bennitt and Nagel made their survey of the "Resident Game and Furbearers of Missouri" it was estimated that no more than about 2500 deer remained in the state. Today deer are reported from every county right up to the Iowa line, and, with perhaps 200,000 deer in the herd, the problem is becoming one of keeping them in balance with the available supplies of food and cover.

Other wildlife species have benefitted from the forest program. On many streams today, good numbers of beaver are reported. Wild turkeys, which seemed on the way to certain extinction, are at least holding their own, and one 25,000-acre refuge is devoted largely to increasing their numbers. In the improved areas of forest land, at least, there have also been substantial increases in the number of racoons, squirrels and other mammals —and even of Bobwhite quail.

One important result of better forest management is adequate protection for the watersheds of the Ozark area. Under the old conditions of over-cutting and over-grazing, annual burn-

(Photo by Missouri Conservation Commission)

ing and general misuse, the condition of the forest soils went steadily downhill. The soils became tightly compacted and the lack of humus allowed the normally thin topsoil to wash away. There were few soil micro-organisms left to keep the land "alive." The rains as they fell could no longer infiltrate these impervious soils and so ran off down the hollows, carrying their load of gravel and silt. Growth of trees and all other plants was slowed by lack of water and the nutrients normally built up in a good forest soil. Tests by the Forest Service showed that even where the water was held on the land and could not run off, up to three hours might be required for a two-inch rain to soak in. This meant a serious lowering of the forest water table and the gradual depletion of the great reservoirs of ground water which pour into our springs and streams.

The first step in getting the forest "water works" to function again is to build up the humus layer by preventing fires. Second is the elimination of grazing to promote the growth of the forest under-story which consists of many shrubs, grasses, legumes and other small flowering plants. At this point the soil organisms begin to increase and the land comes alive again. The third step is to improve the stand of trees by girdling the old cull trees and by cutting out the brushy-type trees (which are thickly entangled, the older growth usually dead and not adding to the annual deposit of humus) thus increasing the deposit of organic matter and, at the same time, releasing quantities of plant nutrients for use by the remaining trees. When these steps have been taken, we find that we have increased tremendously the infiltration of rainfall into the forest floor, thus hold-

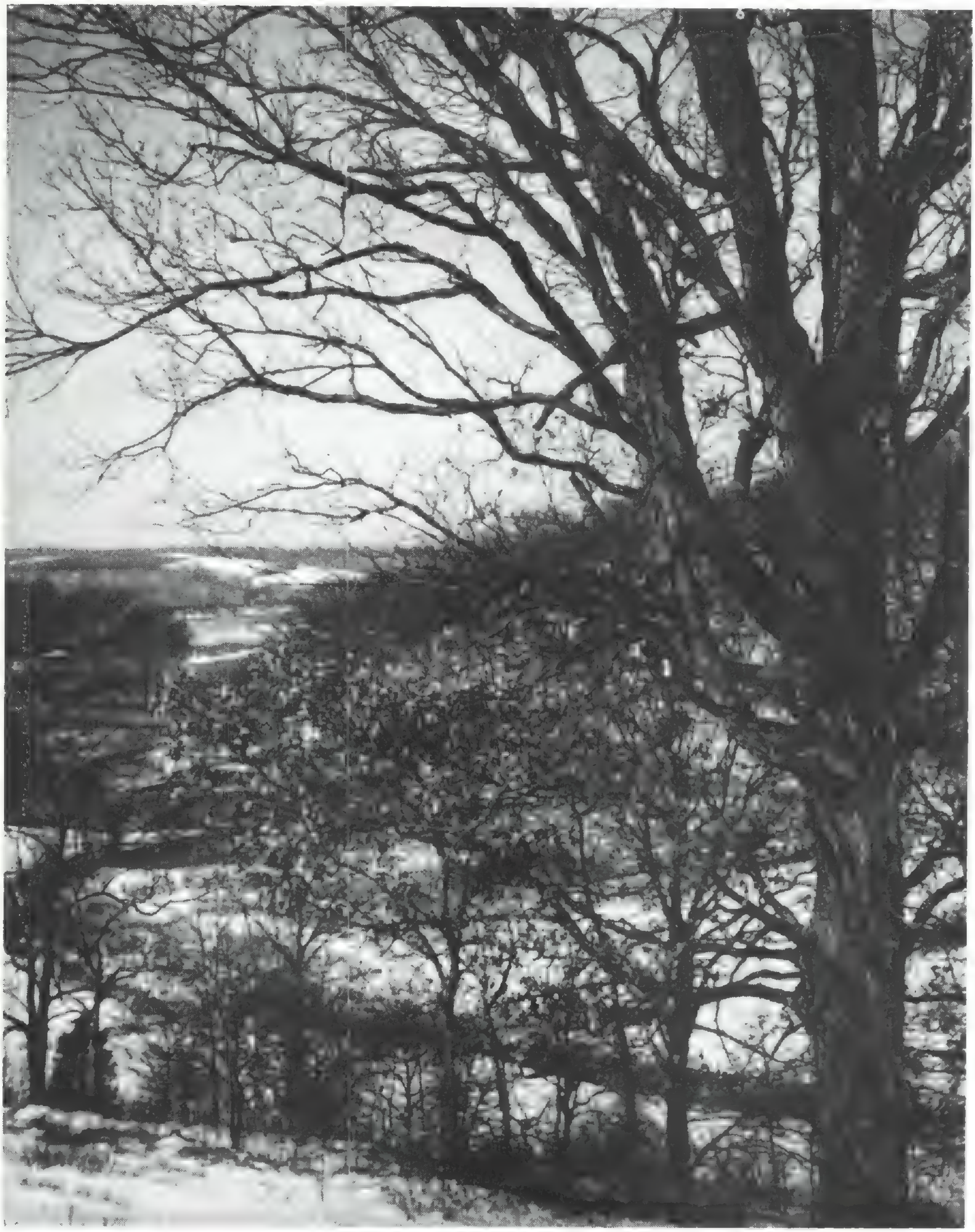
ing surface run-off to a fraction of what it was. The soil which formerly took two hours to absorb two inches of water will now take up this amount in two minutes or even less.

When the measures here described are applied to an entire forest watershed, we can predict many of the interesting things which happen. First of all, forest tree growth on areas where the stand has been improved makes a big spurt. As an example the following case can be cited, although it may not be entirely typical. Recently we saw in the office of Pioneer Forest at Salem a cross-section of a 90-year-old pine tree taken from an area where a release cutting (the removal of old and dead trees and clearing of underbrush) had been made eight years previously. Judging from the rings, in the eight years following the release cutting the growth was almost equal, in terms of diameter, to that in the preceding 80 years—which means a greater increase in volume of lumber in the tree.

As might be expected, with the build-up of humus on the forest floor, less and less water is lost by overland flow following a rain. It is disposed of, instead, by evaporation, subsurface absorption, and transpiration by plants. And as this water moves through the soil and subsoil, instead of over the surface, streams in the watershed are no longer subject to sudden flash floods; instead, they flow clear and with only moderate rises, even in periods of heavy rainfall Moreover, stream-flow is more even throughout the year, peaks after rain are not as great, nor are the lows as severe in time of drought. The reason for this is that water stored in underground reservoirs and in the upper soil filters out into the stream channels more slowly and at a fairly even rate.

There are interesting secondary results from this improvement in the forest "water works." As erosion is checked, less gravel is carried downhill into the streams and they begin to stabilize. More cover grows along the banks and on the gravel and sand-bars which have built up through the years of misuse; and this in itself helps check the damaging effect of future floods. More aquatic plants appear in the streams and are not scoured out by recurring high waters. These plants are at the base of the food chains in the stream, encouraging the growth of plankton, small crustaceans and other life forms which in turn furnish food for the forage fishes such as minnows; and thus the pyramid builds up through the sunfish and goggle-eye to such higher forms as wall-eyed pike and bass. Thus even the fisherman benefits from better forest management.

The botanist also finds interesting material for study in this new forest. For now the plant successions which might have been expected in the over-grazed, over-cut and over-burned timberland no longer take place. New species—or at least species which have long been absent—begin to appear. Perennial grasses such as bluestem and Indian grass take the place of annual cheat and poverty grass, and these are fertilized by native legumes of which there are a dozen or more. Shrubs appear in the forest understory which are



The house at Possum Trot looks across a wooded valley.
Cedar and White Oak like limestone soil.

(Photo by Leonard Hall)

Big Springs

(Photo by Rex Gary)

not detrimental to tree growth and which furnish food for deer and other forms of wildlife. It would be interesting to botanize some of these improved forest stands after twenty years of good management, making the logical projection into the future; and then to compare the record with studies made when the same areas were on the way downhill.

All in all we've made progress in the Ozarks during the past two decades; yet a lot remains to be done. Roughly, it might be said that the 10 per cent of land now held by such public agencies as the State and Federal governments is 90 per cent well managed; the approximately 15 per cent held in corporate and large private ownership is about 50 per cent well managed; and the remaining 75 per cent which is in small private holdings and farm woodlots is perhaps 90 per cent badly managed if it is managed at all. Yet we should not conclude from this that the case is hopeless, for there was a time when *all* forest land capable of being exploited was mismanaged; and there is evidence today that for the first time in the past 100 years, timber growth has caught up with timber use in the nation as a whole.

What really good forest management can mean to the Ozarks and their future was revealed dramatically in a study in which I participated not long

ago. Working with competent foresters, we selected a county in which about 85 per cent of all land is classed as timber land, in which tax revenue is so low as to constitute a real problem, and in which the population is declining because of lack of economic opportunity. An analysis was made of increased growth and current yields from National Forest acreage in the county after 15 years of good management, and the future sustained yields when the maximum growth rate has been reached was estimated. Briefly, it was determined that if this growth rate and yield could be duplicated on all forest land in the county, the labor of some 1200 additional families would be required to handle just the initial processing of forest products; that is, the felling of trees, hauling, and rough milling. Value of rough milled lumber alone would add $3,000,000 to the annual income of the county, while value of forest lands for tax purposes would show a substantial increase. Moreover, if processing were carried a single step further—by turning rough oak boards into oak flooring, for example—both number of workers required and additional income for the county would increase accordingly.

While this study was made for a single county, the facts apply to practically every county in the forested area of the Missouri Ozarks. And while progress comes slowly—still it comes surely. In the forests of the Ozarks conditions generally are far better than they were twenty or even ten years ago. Thus it seems reasonable to say, as we did last January, in the first article of this series, that "today the Ozarks is once again a land of hope and restoration where residents look forward with confidence to a better future."

THE CHRYSANTHEMUM SHOW

The Fall and Winter shows at the Garden will cover longer periods and occupy more greenhouse space this year than ever before. The early chrysanthemums, featuring a fine exhibit by the St. Louis Chrysanthemum Society, went on display the last week in October, along with fall-blooming orchids, principally Baby Moth (*Dendrobium Phalaconopsis*) and Bowringiana hybrid Cattleyas in variety. Later-flowering chrysanthemums were staged in the Linnaean House where they are already making a fine showing against the rich green background of the camellias and evergreen vines. In this cool greenhouse the last of them will stay until the camellias come into bloom, so that this beautiful old building will give the appearance of an old-fashioned flower garden in the deep South from November to March. The orchids will gradually be replaced by later-flowering varieties and Poinsettias will be on mass display during the Christmas holidays. During February and March the orchid exhibit will culminate in a special Golden Jubilee orchid show, honoring Mr. Pring's long connection with the orchid department.

RICE, NORTHWARD HO!

JULIAN A. STEYERMARK

RICE *(Oryza sativa)*, one of the world's most important food plants, is cultivated in warm countries at low altitudes where there is sufficient moisture present. India, China, Japan, Korea, Java, the Philippine Islands, and other oriental countries produce and use vast quantities of the grain. It is also grown and consumed in considerable amounts in parts of Africa and in South and Central America. In the United States the principal commercial rice-growing districts are in Texas, Louisiana, Arkansas, California, and North and South Carolina.

What is the story of rice in Missouri? In the boot-heel lowlands section of southeastern Missouri it is grown in very small quantities, although this corner of the state is where one would expect to find it, since its climatic range is similar to that of cotton. However, in September of 1956 I experienced quite a shock while driving along a stretch of highway in extreme northern Marion County between Taylor, Missouri, and Quincy, Illinois. For there, in the bottomland just east of the city limits of Taylor (about 25 miles northwest of Hannibal), I spotted numerous bright green clumps of a grass growing in a dried-up swale. It appeared unfamiliar at a distance, the fruiting sprays nodding gracefuliy above a leafy cluster of stems that was two to three feet high. Closer inspection of the plants at once revealed their identity as rice. But how unexpected, finding rice this far north in Missouri!

A check-up of this phenomenal occurrence of rice only 30 miles or so away from the Iowa line revealed some additional information regarding its distribution in that area. I was told by the local residents that rice was grown on a commercial scale just a few miles south of Taylor, in a section of the Mississippi River floodplain known as Mark Bottom, occupying hundreds of acres of fertile wet soil. This was news to me, and I was sure that it would be to many other Missourians. Apparently, the rice plants which I had found along the highway had become established from seed accidentally dropped here. It had germinated in the wet soil, and had grown into mature grain-producing plants. An interesting sidelight of this discovery was that, although several people in Taylor had seen rice growing in the extensive acreage under cultivation in Mark Bottom, none of them had realized that rice was growing so close by along the highway until I had called attention to it.

It should be pointed out that another kind of plant of the grass family, a species of wild rice, also called Water-Millet *(Zizaniopsis miliacea)*, occurs in the cypress swamps and drainage ditches of southeastern Missouri lowlands and in the sink-hole ponds (swampy remnants of the ancient peneplain of the Ozarks) of several southeastern Ozark counties. It occurs from Florida to Texas north to Maryland, Kentucky, southeastern Missouri, and Oklahoma, and extends south into Mexico and South America.

On the other hand, the Wild Rice of the northern states (*Zizania aquatica* with its several varieties), which was a staple food of northern tribes of American Indians, especially of the Great Lakes region, is occasionally found around borders of ponds and sloughs in parts of central and southeastern Missouri. It is often planted as a food for waterfowl. Although it can be purchased at many food stores, it commands a fairly high price, and for that reason is not used as frequently as the commonly cultivated *Oryza sativa*. However, it is becoming increasingly popular as a complement to turkey or other fowl served at Thanksgiving or Christmas dinner. Together with its varieties, *Zizania aquatica* ranges from portions of Canada and Nova Scotia south to Florida and west to Idaho, North Dakota, Nebraska, and Texas.

AN AFRICAN VIOLET SOCIETY IS BORN — THE AFRICAN VIOLET SOCIETY OF AMERICA, INC.

ADELE TRETTER

It is rather astounding to realize that a little house-plant such as the African Violet (known botanically as Saintpaulia) is responsible for a national plant society. Yet, when a small group of people presented the first African Violet show in Atlanta, Georgia, on November 8 and 9, 1946, the interest in an organized society was manifested first by the formation of the Atlanta African Violet Club; and, later, as a result of an extra meeting on the final day of the Show, in the organization of the African Violet Society of America. The Society was incorporated on June 30, 1947, and, since the number of members had increased so rapidly, the charter memberships were closed by July, 1947.

Under the editorial direction of Alma Wright, assisted by Mary Parker, the material for a bulletin was assembled and the *African Violet Magazine* was published in 1948 with a first issue of 500 copies. The Society held its first annual meeting in Atlanta in the Fall of 1947, with an accompanying African Violet Show, thus establishing the custom of presenting a large show with each annual meeting of the Society.

The object of the Society is to afford a beneficial association of persons interested in African Violets, to stimulate an interest in the propagation and culture of African Violets, to encourage the organization of new and improved varieties, and also to gather and publish reliable information concerning the culture and propagation of African Violets. There are six classes of membership: individual, commercial, research, sustaining, life, and honorary. There are now more than 328 affiliated chapters with a total membership of about 15,000; in addition, there are 123 commercial memberships. The Society now has clubs and members in other countries including Canada, Alaska, British Columbia, Africa, Nova Scotia, Cuba, Italy, Hawaii, Germany, Indo China, and England.

THE METROPOLITAN ST. LOUIS COUNCIL OF AFRICAN VIOLET CLUBS

ADELE TRETTER

The first African Violet Club in this locality (the "Webster Groves African Violet Society") was organized in January 1949 by a group of Webster Groves women who were interested in growing African Violets as a hobby. Through the influence of this club, more African Violet enthusiasts in St. Louis began grouping into organized societies; the earliest of which were the "Viking Club" (1949) and the "Normandy" (1951).

In the spring of 1952, these three clubs sponsored the first African Violet Show for the St. Louis vicinity with Mrs. Farris of Webster Groves as general chairman. The show was successful in further popularizing the African Violet and in stimulating the organization of five new clubs in St. Louis and St. Louis County—the "Ionantha", the "Greater St. Louis", the "Rainbow", the "Amethyst", and the "Holly"—all organized in 1952.

On February 3, 1953, the president and two representatives of each club met for the purpose of integrating the groups into a Council which was to have one general meeting and two board meetings each year. With the formation of the Council, Mrs. A. Zimmerman, of the Webster Groves group, was elected the first President. As one of its first functions the Council presented the second St. Louis African Violet Show April 18, 1953, under the chairmanship of Mrs. W. Mock of Webster Groves. The "County Bells" and the "Twilight" clubs were organized that same year. At the general Council Meeting, Mrs. Wayman of "Viking" was elected president for 1954.

When the "Evening Sunset" club organized in January, 1954, the total number of clubs in the Council was brought to eleven. The Council, with Mrs. Mock as chairman, was hostess to the National African Violet Society Convention and Show held at the Hotel Chase in April of 1954. Among the activities planned for the guests by the Council was a tour of St. Louis ending at the Missouri Botanical Garden where, following a guided tour of the Garden, tea was served at the Museum. At the 1954 General Council Meeting Mrs. Thelma Usinger of "Amethyst" was elected to succeed Mrs. Wayman. A twelfth club and the first to include husbands with their wives, the "Knights and Ladies", was formed in 1954.

Twelve clubs participated in the Third African Violet Show given in April of 1955 (the "Cinderella" club had been added and the "Evening Sunset" discontinued). In November Mrs. W. F. Anderson of "Viking" was elected by the Council to serve as president during 1956. At this meeting the "Normandy" and the "Ionantha" clubs agreed to unite to form the "Normandy-Ionantha Club". The Fourth Show was held at the Missouri Botanical Garden in April of 1956 with Mrs. Fred Tretter of "Greater St. Louis Club" chairman. The fifth

and most recent Council meeting, held in October, elected Mrs. Tretter to be the 1957 president.

Plans are being made for the fifth African Violet Show to be given in March of next year at the Missouri Botanical Garden. The Council, now consisting of ten clubs, is called the "Metropolitan St. Louis Council of African Violet Clubs" and it is affiliated with the AFRICAN VIOLET SOCIETY OF AMERICA, INC.

THE HENRY SHAW CHRISTMAS PARTY!

THIS year, as last, the Women's Committee of the Garden will stage a special Christmas Show in Mr. Shaw's Old Residence, "TOWER GROVE". The show, "Henry Shaw's Christmas Party", will be given under the chairmanship of Mrs. Martin Lammert III with Mrs. William Hedley and Mrs. Carroll Mastin as very active co-chairmen (since Mrs. Lammert is recovering from a serious injury). Plans are now being made, under the direction of Mrs. T. Randolph Potter and co-chairmen Mrs. Grant William and Mrs. Edward L. Bakewell, Jr., to create exciting room decorations. Every room of the handsome Shaw Residence will offer a spectacular Christmas theme, filled with ideas that will be easy and thrilling to adapt to one's own home. In the Museum building there will be a display featuring the botanical aspects of Christmas decorations, prepared by Dr. Cutler and his students in Economic Botany. Accompanying this exhibit will be "Sugar 'n Spice", a baked goods sale, with Mrs. J. J. Jannuzzo and Mrs. Steven J. Wolff as co-chairmen. The hostesses will be Mrs. George Pring and Mrs. Arthur J. Krueger. Other special committees and their chairmen are: General Arrangements, Mrs. Robert W. Otto and Mrs. Lewis B. Stuart; Publicity, Mrs. Rolla M. Horwitz; Music, Mrs. William P. Chrisler; Corsages, Mrs. E. J. Neuner; Christmas Treats, Mrs. Mary Baer; Ticket Sales (Federated Garden Clubs), Mrs. Frank Vesser—(Women's Committee and General Distribution), Mrs. Charles Rice with Mrs. Earl Hath and Mrs. P. H. Britt; Treasurer, Mrs. John R. Shepley.

The show will be open from Thursday, December 6th, through Sunday the 9th, from 11 in the morning until 7 in the evening. Admission will be one dollar for adults and fifty cents for children, and the entire proceeds will go to the Garden. Tickets are now available from members of the Women's Committee, at Lammert's Clayton Store and at the Main Gate House of the Garden. Checks should be made payable to Shaw's Garden and forwarded to Mrs. Charles M. Rice, #1 Oak Knoll, St. Louis 5, Missouri.

THIRD ANNUAL SYMPOSIUM OF SYSTEMATICS

On October 26th and 27th the third annual symposium on problems of Systematics (the scientific classification of plants and animals) was staged by the Garden and the Henry Shaw School of Botany, with generous financial help and moral support from the National Science Foundation. Visitors (136 in all) arrived by plane, train, and motor car. The bulk of them were from the Middle West but some came from as far as the New York Botanical Garden, the University of Colorado and Baton Rouge, Louisiana. All were interested in basic problems connected with the classification of plants and animals; they came from universities, colleges, museums, botanical gardens, natural history surveys. Some (about a third) were technically zoologists, the rest were mostly botanists. Not quite half of them were graduate students just starting out on a technical career, a few were amateurs, the remainder were teachers and staff members, several of them scholars with international reputations.

Now that the continued encouragement and development of science are becoming of real national concern, support for the scientific work which goes on at such independently endowed centers as the Garden is growing from year to year in various ways. With its outstanding herbarium and fine library (both of them begun by Henry Shaw) the Garden makes an ideal place for informal get-togethers of this sort. Many of those attending this conference arrived a day or two early or stayed over the following Sunday in order to make full use of the herbarium and library. Sessions were held in the old Museum built by Mr. Shaw, now so popular as a meeting place for plant-minded groups that it averages one meeting a day during some months.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (spring to fall) and until six (in the winter time) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.

MISSOURI BOTANICAL GARDEN BULLETIN

olume XLIV December, 1956 Number 10

"Delightful scientifick Shade!
For Knowledge, as for
Pleasure made."

From a poem on the Oxford Botanic Garden, published in 1713 in a book, *Vertumnus*, by Abel Evans.

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Notice: There will be no January BULLETIN. In 1957 the BULLETIN will be published in February, March, April, June, September and October.

THE question most frequently asked the Garden in December is *"How can I save my poinsettia plant?*

Commercial growers produce poinsettias for Christmas by starting new plants from cuttings in early summer; but if you want to save your plant for next year, the Garden recommends the following procedure. After the plant has lost its leaves, store it in a cool place until May. Do not water it. In May, cut the stems back to six or eight inches above the rim of the pot. Shake some of the soil from the roots and repot, using good garden soil, into a six- or seven-inch pot, which has a piece of broken pot placed over the hole in the bottom. After the poinsettia has been repotted, water it, then put it outside in a sunny place with the pot set into cinders or gravel to a depth of about three inches. Within a few weeks several shoots will appear, two or three of which should be kept and the others removed. These branches will grow quite tall in one season and must be tied to a support, preferably a bamboo cane. The plants may be started in June and even early July. Although late planting will prevent the poinsettias from growing too tall, weak plants that have been kept dormant too long often fail to grow. The pots should be lifted occasionally to prevent large roots from growing through the hole of the pot into the soil beneath, for the severing of the main root will cause the leaves to drop when the plant is taken inside in the fall.

Cover: Dr. George T. Moore

Missouri Botanical Garden Bulletin

Vol. XLIV DECEMBER, 1956 No. 10

DR. GEORGE T. MOORE, DIRECTOR 1913–1953

On the evening of November 27th Dr. Moore died at his home in the Garden grounds, thus bringing to a close almost half a century of service to this institution. He came to St. Louis in 1909 at the age of 38, already well known as a brilliant teacher and investigator, who at the very outset of his professional career had solved the problem of controlling effectively those microscopic plants which can be so obnoxious in public water supplies.

St. Louisans knew Dr. Moore as a skillful administrator, an effective participant in many civic enterprises, a polished and witty master of ceremonies on many public occasions . . . but he was much more than this. His brilliant research has already been mentioned. He was closely connected with building up the Marine Biological Research Station at Wood's Hole, Massachusetts, into a national biological research center and he kept up this work after moving to St. Louis. Until after World War I, he taught one of its outstanding summer courses every year and many of the country's top flight biologists received part of their training under his sharp eyes. Through the twenties and thirties he maintained his summer home in Woods Hole and continued as an effective influence in national scientific affairs there and elsewhere. During his early years in St. Louis he taught both graduate and undergraduate courses in the Henry Shaw School of Botany. He was most effective as a teacher; the few students who carried on graduate work under his personal direction have all had distinguished careers.

In 1913 he was made Director. Under his supervision the Garden was rapidly rebuilt. Then as now its greatest problem was rising operating costs, particularly labor costs. These were greatly reduced by redesigning the entire garden. Inefficient old greenhouses were replaced by new ones, the elaborate and time-consuming flower beds of Mr. Shaw's day were streamlined or eliminated altogether. Outstanding scientists were added to the staff, special fellowships were offered to graduate students in botany and the herbarium was rapidly expanded.

After World War I the Garden again faced the problems which rising prices bring to endowed institutions. They were met for the time being by getting court permission to sell enough Garden property to acquire the Gray

Summit Arboretum and to build a set of orchid greenhouses.

For the last half of his directorship, Dr. Moore's first concern was the attempt to raise the large endowment necessary to keep the Garden on the course charted by Henry Shaw. His annual reports were eloquent, yet his own operating finesse kept the community at large from realizing the Garden's increasingly urgent needs. He retrenched as skillfully as he advanced. All work in Plant Physiology and considerable portions of the library were gradually transferred to Washington University. Mechanized equipment replaced hand labor. Elaborate displays such as the Iris garden requiring many man-hours per year were replaced by smaller ones. Yet through all these strategic retreats he kept up his morale, as well as that of his staff, and as late as 1946 was having architects draw up detailed plans for a new herbarium building.

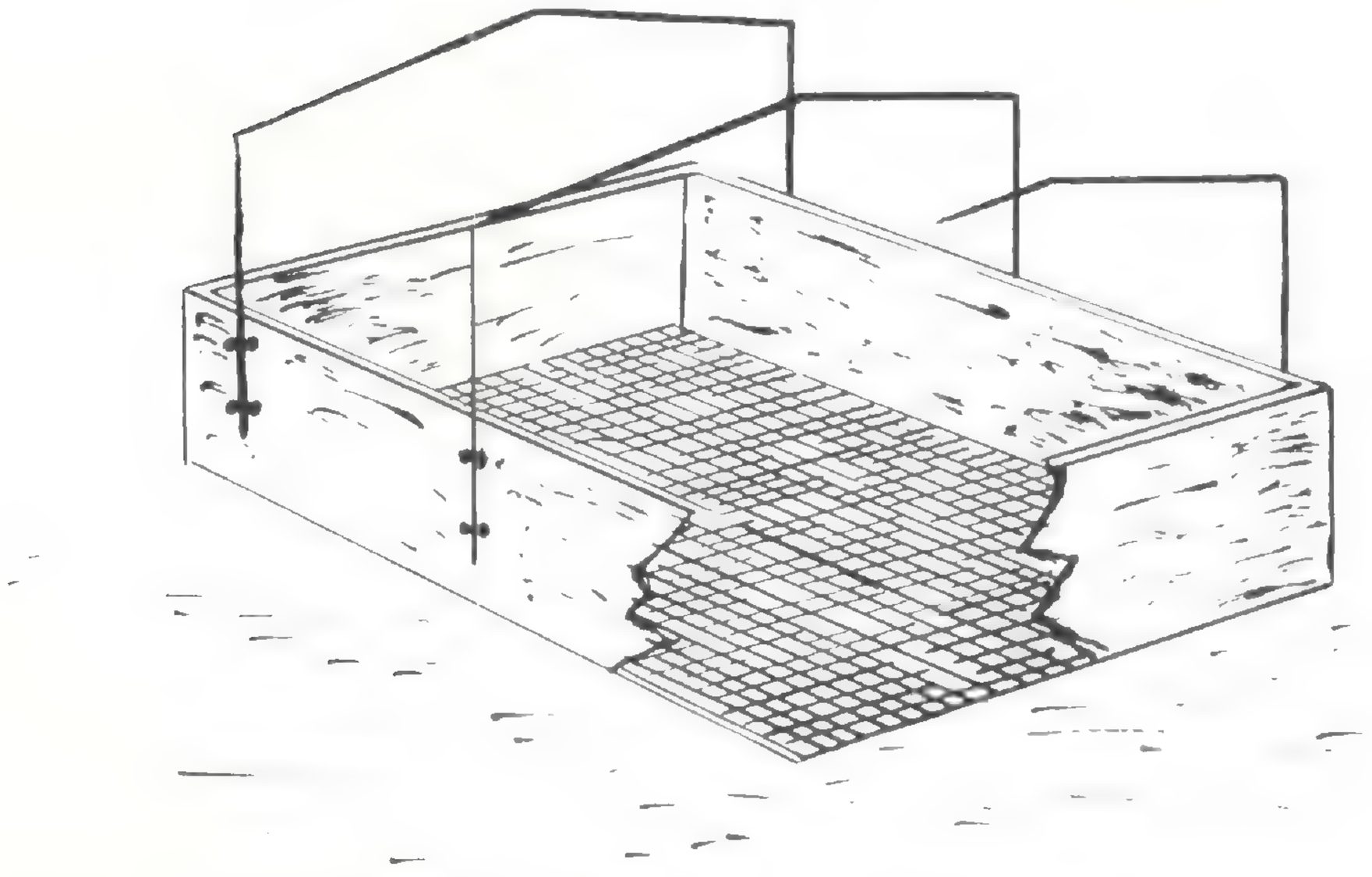
To those who knew him well, he was generous, warm-hearted, and a master at kindly repartee. Outwardly, he maintained a dignified reserve, yet, behind the curt nod, there was always the twinkle in the eye; an innate kindliness softened the firm lines around the mouth. Many a student or staff member suddenly faced with overwhelming personal or professional problems found his burden lightened by Dr. Moore's quick perception, human understanding, and vast common sense.—E. A.

THE LIPPAGATOR METHOD OF PLANT PROPAGATION

HELMUT TUTASS

In recent years, methods of vegetative plant-propagation have developed, which are superior to those practiced in the past. One which has proved to be especially valuable to the gardner whose greenhouse is the living-room, kitchen, or basement, involves the use of the "lippagator" (named for Mr. Louis Lipp of the Holden Arboretum near Cleveland, who promoted the use of this method of plant propagation). The lippagator is a flat box filled with a loose rooting mixture and covered with a plastic sheet supported by a frame. Such a box can be built easily at low cost and has been used successfully in homes as well as here at the Garden.

To build a lippagator (see sketch), use a greenhouse flat or a box approximately 21 inches long × 15 inches wide × 6 inches high, made of wood or a light-weight metal. In the bottom drill holes, one-half inch in diameter, about three inches apart, to provide the necessary drainage. If a wooden box is used, the bottom can be made of wire screen—quarter-inch mesh is good for most rooting mixtures (sand may require a finer mesh). Good drainage is essential to prevent the water from becoming stagnant and the cuttings from rotting. For the frame, use any wire which is strong enough to support the weight of the plastic sheet and which can be bent easily into the form illustrated. The distance from the bottom of the box to the highest point of the frame is about 14 inches; the outer edges should be 1 to 2 inches lower so



Sketch of wooden lippagator box with wire screen bottom

that the water which condenses on the inside of the plastic can run down the sides, instead of dripping on the cuttings, causing them to rot. The plastic should be large enough to cover completely the top and sides, with margins wide enough to be folded beneath the box and held by its weight. Since the plastic holds moisture and thus maintains a high humidity, yet is porous enough to permit such gases as oxygen and carbon dioxide to pass freely, it creates in the lippagator a microclimate which has proved favorable for root growth.

A good rooting mixture can be made with peat moss mixed with equal parts of one of the following: styrofoam, permalite, or medium-coarse sand, washed; all of which can be obtained at a garden supply store. Put a 4-inch layer of one of these mixtures into the lippagator box and sprinkle it thoroughly with water. Into this loose mixture, insert the cuttings. If the cuttings are from several kinds of plants, differing in their rooting habits, it is best to keep the different kinds in separate pots or pans, filled with the rooting mixture, which can be set in the lippagator box. This will allow removal of plants that are well-rooted without disturbing those less well-developed. Furthermore, if rooted in separate pots, the cuttings will not need transplanting when they are taken from the lippagator; but rather, they can be removed undisturbed in the pot and, therefore, can better withstand the change to the more normal climate of the greenhouse or livingroom.

Rooting hormones can be used to speed up root development on plants known to respond favorably to their influence; however, for those plants whose response is not known, the use of hormones should be avoided, since they may have an injurious effect.

After the cuttings have been placed in the lippagator, cover the frame and box with the sheet of plastic, tucking it under the edges in such a way that one end can easily be lifted as a window to check on the progress of root-

ing. Additional water may not be necessary for weeks; however, if the bedding material becomes dry, water thoroughly, using a gentle spray and warm water (slightly higher than room temperature). Cold water shocks plants—the yellow leafspots on African Violets, for example, are well-known signs of such mistreatment. The lippagator should be kept at about 60° to 75° F. (room temperature) in a bright place, but not in direct sunlight, especially in summer. Good locations are an east, west or north window in the house in winter and in the shade of a tree in summer.

As soon as the cuttings have rooted, they can be removed from the lippagator. They wilt slightly for a few days until they become acclimatized to the conditions of the open air. If but one kind of plant is put into the lippagator, the cover can be removed gradually, permitting the plants to adjust slowly.

This method of propagating plants is simple to use; it requires little care, and the results are excellent.

HORTICULTURE COURSES FOR SPRING 1957

THREE courses in Horticulture will be offered by the Garden in the Spring of 1957. Two of these, Plant Propagation and Spring Horticulture, will be conducted in the Experimental Greenhouse at the Garden; the third, Growing Orchids in the Home, will be a single, full-day session at the Orchid Range of the Garden Arboretum, Gray Summit, Missouri.

One of the best ways to learn to garden effectively is to exchange information and plant materials with other amateur gardeners. A good feature of these courses is that they bring amateurs together in an informal way, enabling them to learn from each other as well as from their instructors.

As materials for the courses are purchased immediately after the closing registration date, no registration fees can be refunded after the last day of registration. Please send registration fees to:

Horticultural Courses,
Missouri Botanical Garden,
2315 Tower Grove Avenue,
St. Louis 10, Missouri.

COURSE III—PLANT PROPAGATION

Instructor: F. G. Meyer

Four sections (each with two periods of instruction). Limited to 60 persons (minimum of 10 per section).

Place: Experimental Greenhouse, Missouri Botanical Garden. Enter Cleveland Avenue gate, 2221 Tower Grove Avenue.

Schedule: Section I—
Friday afternoons, January 18, 25, 1:00–4:00 P. M.

Section II—
Saturday mornings, January 19, 26, 9:00 A. M.–12:00 Noon.

Section III—
Wednesday afternoons, January 30, February 6, 1:00–4:00 P.M.

Section IV—
Saturday mornings, February 2, 9, 9:00 A. M.–12:00 Noon.

Content of Course:

Discussion of the principal methods of propagating plants by vegetative means: root cuttings, suckers, division, crowns, hard- and soft-wood stem cuttings, summer wood cuttings, offsets, layering, scales, tubers.

Display of various propagating methods.

Rooting plants under mist.

Rooting plants under plastic (the "Lippagator").

Air layering.

Two practice sessions in greenhouse, making cuttings.

One Lippagator (plastic-covered propagating box) given to each student.

At least 50 kinds of plants per student (house plants, broad leaf evergreens, etc.).

Registration (by phone or mail): December 15 to January 14, Fee—$10.00 (includes all materials).

Course IV—Spring Horticulture

Instructor: Members of the Garden Staff

Four sections (five periods of instruction). Limited to 85 students.

Place: Experimental Greenhouse, Missouri Botanical Garden. Enter Cleveland Avenue gate, 2221 Tower Grove Avenue.

Schedule: Section I—

Friday afternoons, 1:00–4:00 P. M. March 22, 29, April 5, 12, 26

Section II—

Monday afternoons, 1:00–4:00 P. M. March 25, April 1, 8, 22, 29

Section III—

Wednesday afternoons, 1:00–4:00 P. M. March 27, April 3, 10, 24, May 1

Section IV—

Saturday mornings, 9:00 A. M.–12:00 Noon. March 30, April 6, 13, 27, May 4

Content of Course:

Five lectures, including practical discussion on soils, seed-sowing, fertilizers, liming, mulching; kinds of broad-leaf evergreens for St. Louis; pests and diseases.

Demonstration of pruning trees and shrubs.

Instructive tour of the Garden's world-famous library and herbarium.

Five sessions in the greenhouse. Each student will receive four metal seed flats with instruction in seed sowing and transplanting of summer annuals and perennials.

Plants and flats may be taken home at end of course.

There will be enough space to plant 16 kinds of seeds in seed flats. Seeds available at the greenhouse, or bring your own special kinds.

Registration (by phone or mail): February 11 to March 22, Fee—$15.00 (covers all materials, including flats).

Course V—Growing Orchids in the Home

Instructor: R. J. Gillespie

One section (one period of instruction).

Place: Orchid Range, Missouri Botanical Garden Arboretum, Gray Summit, Missouri.

Time: April 20, 1957, 10:00 A. M. to 4:00 P. M.

Schedule and Content of Course:

10:00 A. M.
Kinds of orchids suitable for home culture (orchids that like St. Louis).
Discussion of factors influencing orchid growth and development: light, temperature, etc., for home-adapted genera only.
How these conditions can be created in the average home.
Potting demonstration. Question and answer period, if time permits.
12:00 Noon. Lunch. Garden supplies coffee and soda.
1:00 P. M. Growing Orchids in unusual containers in the home. Demonstration of potting and care.
2:00 P. M. Inspection of greenhouses.
3:00 P. M. Individual potting instruction by members of Orchid Department staff. Students may take potted plant home.

Registration (by phone or mail):
March 15 to April 15, Fee—$10.00.

PERSONAL MEMORIES OF MR. SHAW

In Henry Shaw's day it was the fashion to put on public celebrations with formal speeches duly reprinted in the local newspapers. In his will, a long and remarkable document, he provided special funds for formal banquets, and it is from the records of one of these banquets, held in 1892, three years after his death, that we owe our best first-hand accounts of Mr. Shaw as a merchant and a man of affairs. One of the speakers at this particular banquet was Professor J. D. Butler of the University of Wisconsin. For over twenty years he had maintained an increasingly close friendship with Mr. Shaw, visiting him repeatedly in his own home, and entertaining him in return. In the Garden's library is the original typewritten record of the entire banquet, complete even to inserts for "Laughter" and "Applause." It tells us something of Mr. Shaw's memory of Mill Hill school where he was trained as a boy and goes on in considerable detail to describe how he built up the beginnings of his fortune.—E.A.

"I was so favorably introduced to Mr. Shaw that he urged me, whenever I should be coming in this direction, to make my home with him. He told me the course of his life so that I would know whether to find him in Locust St. or in Tower Grove, and the result was that for more than twenty years I broke his bread and I have had him under my own roof breaking my bread. He loved to talk of his early days in Mill Hill. To speak of the cedar that was planted there by Linnaeus in 1736. He led me to a tree six years ago near his own ground planted by himself that was already a hundred feet high. He was pleased with a couplet that I remembered to quote,—

'A forest planted by himself he sees,
And loves the old contemporary trees.'

"He used to tell me that every

scholar at Mill Hill had a square rod of ground that he was allowed to fill in any way he chose. The child is father of the man. We see there the baby figure of a giant mass of things to come at large. He told me in our manifold conversations of his voyaging four and seventy days with his father in an old Danish prize vessel, then reaching Quebec, of business prospects there and in Montreal not flattering, of sleighriding across Vermont to reach New York, no room for him there; of a twenty-three days voyage to New Orleans, of his welcome there by an old family friend, a sugar planter, and of his half resolution to become a sugar planter, but he knew something about cutlery but nothing about canebrakes. He found that at New Orleans he was within ninety days by keel boat of St. Louis. He was about putting his baggage aboard a keelboat when a vessel, schooner rigged, arrived there from Philadelphia that had also a steam engine aboard and promised a passage in forty-five days to St. Louis. He went on board the steamer and she arrived here on time, within two years of the first steamer's arrival in this City which was in 1817, six weeks voyage from Louisville. He went up to St. Charles before settling here. Thought St. Louis too big a place for him at first. In his parlor in Locust St. he had standing the arm chair with a table leaf that he used in the days of his business. Sitting there he used to tell me of his early adventures. One of the first things he learned was that hardware was brought across from Philadelphia at nine dollars a hundred but he had ascertained that he could bring it for three dollars from Liverpool. He at once laid in a good stock of every variety of hardware and was master of the market here. As early as 1824 he obtained a contract for supplying all the hardware needed in Chicago at Fort Dearborn, and kept it for a dozen years.

"He was up to everything in aspiration, and down to everything in the drudgery of detail.

"The first time he went down the River, having observed that sugar here ran up to twenty-five cents at some time in the year, he bought a large quantity slightly damaged at two cents and brought it here for one more. It was a drug. But when he began to repent of his huge inlay of sugar a flotilla came along here with supplies for the United States posts up the River, but they had no sugar. Their barge that had it had sunk on a snag, and all the sugar to be had in St. Louis was in the hands of Henry Shaw. (Laughter and applause.)

"Is it any wonder, in view of these two or three little things that within one and twenty years he had all the money, as he thought, that any bachelor needed to have, and resolved henceforth to enjoy his fortune? It was because he had sense enough to retire that of no distemper, of no blast he died, but fell like ripened fruit that mellows on, still wondered at because he dropped no sooner. I hope every rich man here will learn by his example. (Applause.)

"I will not tell you half the things I thought of, but there is one I will mention. The Shakespearan mulberry

has become celebrated in the Garden, planted on a spot selected by Adelaide Nielson. Mr. Shaw's acquaintance with that lady began in this way. We were sitting together in the back parlor there at Tower Grove when a card was brought in from a lady asking permission to dry her feet, and that card bore the name of Adelaide Nielson. She was cordially greeted and seated herself at one side of the grate, took off her shoes and warmed her feet. I sat at the other side of the grate, Mr. Shaw between us. She was exultant just then at finishing her one hundredth impersonation of Juliet. She enjoyed our conversation all the more because we both of us had been in her native Spain.

"Many a walk did we take through the Garden. The last one we lingered at the cenotaph for Nuttal, the first botanist that explored the Arkansas; passed on, then, to the shrine of the temple and I noticed the writing on the roof and proposed the phrase 'Ignorance, the curse of God; Knowledge, the wing wherewith we fly to heaven.' 'Too many words for the shrine,' said Shaw, 'But I would gladly see it on the cornice.' We passed on, then, to his mausoleum. We had the gate opened. His statue, recumbent on the lid of the sarcophagus with the rose in its hand was there laying one side; the grave open. I said to him, 'I have lately been in Egypt and in the heart of the great pyramid have laid me down and folded my arms on the coffin of Pharaoh, and, with your permission, I will have the first use of yours.'"
(Laughter and applause.)

WHY BOTANISTS VISIT MATH DEPARTMENTS

EDGAR ANDERSON

In the early summer of 1931 Sir Ronald Fisher, the great English statistician, came to visit me in St. Louis. At the very last minute St. Louis mathematicians tried to arrange a luncheon for him, an attempt which fell through because the distinguished guest-of-honor was busy making a pilgrimage to Meramec Highlands and to Kirkwood. He spent the morning out in what is now Osage Hills, looking at redbud trees on the rocky hillsides above the Frisco tracks. At the actual hour when the luncheon might have been held, he was dining informally on sandwiches and ice-cold lemonade in a screened porch at the corner of Argonne and Dixon, reminiscing happily with Mrs. Phil Rau.

Sir Ronald was not behaving capriciously; it was a pilgrimage in a very real sense. Mrs. Rau's brother, the late J. Arthur Harris, was the first staff member of the Missouri Botanical Garden to bring mathematics to the study of evolution. Early in the 1900's he made a statistical study of redbud seedpods from Meramec Highlands. Though it was a pioneer effort and contributed nothing directly to our understanding of their amazing variability it was mathematically most ingenious. Sir Ronald developed from it his widely used "Analysis of Variance".

Dr. Harris left St. Louis nearly fifty years ago and at the time of his death was a botanist at the University of Minnesota, dealing skillfully with such diverse problems as the chemistry of drought resistance in desert plants and the measurement of crop yields. Yet scarcely a working day passes, but that, by way of Sir Ronald's methods, J. Arthur Harris' bubbling originality is put to good use in our local scientific laboratories and industrial establishments. Of the hundreds of St. Louisans who in this way follow in Harris' footsteps during any one year, few indeed realize that a basic part of the sharp mathematical tool they use was forged at Shaw's Garden. Somehow, the fact that botanists are really up to such things never catches the public's imagination.

Two years before Sir Ronald's visit, one of the best science reporters we have ever had in St. Louis, Miss Edna Warren of the *Globe-Democrat*, wrote a feature article about my own first attempt to analyze evolution mathematically. She somehow waded through my dullish technical paper, with its page after page of measurements, and produced an understanding and interesting account of my four years of work with native species of Iris.

This early work led to a scholarship in England for study with Sir Ronald. I was greatly helped by the association with his sharp and original mind. Yet much as I was impressed by the good sound practical help his methods were bringing to many other fields (scoring blood counts in hospital laboratories, yield-testing of oats and wheat, the laying out of experimental plots), one fact became increasingly clear. They did not help my particular problem. To my basic quest for a measurement of species differences so efficient that one could use it in studying how evolution is actually going on right now, they had little to offer. In some phases of the work they helped; in others they gave an incomplete answer, sometimes even a wrong one.

For a good fifteen years after Sir Ronald's visit, I blundered away at the basic problem. I read, experimented, studied species in the field, the laboratory and the herbarium. Gradually I dug down to pay dirt, working out methods of putting the complicated sets of facts into exact little pictures and diagrams. In my book, *Plants, Man and Life* I have written the story of how, working through the winter of 1944 on a sunny roof-top in Mexico, I finally hammered out a new method which was half a mathematical table, half a precise picture. With it one could record and measure the differences between two Mexican corn fields with only a few hours of work and get an answer which agreed with common sense and good judgment.

Now the road was clear; I rapidly got down to fundamentals. The basic techniques were refined to the point where (to take an actual example) one could describe species he had never seen. By measuring thirty plants in one mountain meadow, a detailed technical description of another species which had once hybridized with their ancestors could be drawn up, even when one knew nothing about the flora of the region or anything at all about the species which he was predicting!

Finally in 1952 I waded into the basic problem of why statistical methods are sometimes so helpful, yet sometimes give the wrong answer. The explanation was a simple one. If the basic facts in any particular problem are numbers (let us say the yield in bushels of a series of wheat varieties) then statistics does a good job. If the basic facts are patterns (as for instance the intricate and complicated kinds of differences between two species), then at best statistics is inefficient; at the worst it gives the wrong answer but veils its failure in impressive technical language.

This was (and is) a new idea to most statisticians. Outsiders who rush in with fresh ways of looking at old problems are seldom popular. However, a few of the country's best mathematicians took a most sympathetic attitude and began to recommend these new ideas and methods, not merely to biologists, but to scholars in any field where the basic facts were patterns. This group who have brought their problems to me in the last year or so are so varied, seen as a whole, that it is almost comic to think of them arriving together at the door of a busy botanist. One was concerned with a medical study of healthy versus diseased tissues, another dealt with the problem of measuring depressed areas in our big cities. The easiest problem to solve was an analysis of basic patterns in English poetry. The one in which the new methods and insights are already of the most assistance is a large-scale attempt by a group of social anthropologists to analyze what happens when groups of men live and work closely together.

The deeper I dug, the more apparent it was that I had gotten down to something basic, something of real importance to science, to industry, something which, if we must classify it, belongs in the wide field of applied mathematics. Accordingly, for the last two years (on top of my regular duties), I have been working out the details of shifting as much of my work as possible to other shoulders and of arranging for funds to carry on my research. In odd moments in the last year I have even managed to write chapters for two books which are now in the press. One is technical. It grew out of the fact that these new methods and points of view are so useful in plant breeding that seven of my students are now highly successful plant breeders. The other is in the Golden Jubilee Volume of the Botanical Society of America. In the preparation of it, I was greatly helped by Professors Feinberg and Primakov of the Physics Department at Washington University, as well as by my mathematical friends. In as simple language as possible it discusses the area where statistics, and natural history, and applied mathematics come together.

A generous grant from the Guggenheim Foundation will allow me to take half-time leave of absence during the next year or so. I shall first be the guest of the Mathematics Department at Princeton, where I have been dropping in every six months or so for several years. I am taking along data and materials on problems that lie in the field between mathematics and bi-

ology, including one or two that were chosen because they are comparatively simple ones. It is the simplest problems which are the most rewarding when you finally see how you can get down to them—and in this case I think I do.

To me one of the most surprising things about my adventures out into the unknown has been the quick reactions of a few industrialists. Apparently in these days some American businessmen are, on the whole, more alert to new developments than are many scholars in our great universities. Before I had published a single paper on my studies of corn, one of the big corn-breeding companies had sent its research director to see me. Since that time it has supplied the money for technical assistants and graduate fellowships for use in basic research. All I did in return was to take an interest in the company's research problems and talk from time to time with the men who were carrying them on. More recently the Brewing Industry has been supporting some fundamental studies of hops in which my new methods have been strikingly successful. A former student is finding them useful in Sorghum breeding, another has applied them effectively to the baffling problem of how to pick out from the thousands of kinds of beans in Central America, the dozen or so which are best to breed from. This summer the American director of a coffee-breeding project in Ethiopia came to work with me and I hope world conditions may permit me to work with him there within the next year. Two other students are now working in the South Pacific on the classification and improvement of native crop plants. All of these projects bring in at least enough money to carry on the work and sometimes a little more. At a time when the Garden is hard-pressed financially, they are making it possible to build up our Museum of Useful Plants into an internationally significant center.

NOTES

DURING October and November, two scientists interested in the flora of Mexico worked for extended periods in the Garden library and herbarium. Dr. Ida Langman of the Philadelphia Academy of Natural Sciences staff has been working for some years on a comprehensive bibliography of Mexican botany. Her stop-over here en route to Mexico was mutually profitable. She was able to locate a number of references here not available elsewhere and to consult with the staff about various details of her trip to Mexico. On the other hand she helped several of us who were puzzling over obscure references and departed for Mexico City with a long list of scientific errands to carry out for us there. Ing. Efriam Hernandez Xolocotzi, an authority on both the native flora and the varieties of cultivated plants of

From "Villa Aldobrandina Tusculana", a book of etchings by Dominique Barriere depicting the famous Villa Aldobrandina in Tusculum near Rome. This magnificent old garden book, published in Rome in 1647, was recently presented to the Garden library by **Mr. Henry Putzel.**

Mexico, has been closely associated with the basic agricultural research and plant breeding program carried on in that country by the Rockefeller Foundation and the Mexican Government. He is now in this country for a year's work on the range grasses of Mexico. During his few weeks at the Garden he worked in the library and the grass herbarium, and consulted with members of the staff. Dr. Alfredo Cocucci, of the University of Cordoba, Argentina, is here for a year's study and work in the herbarium on the annual assistantship provided by the National Science Foundation to release Dr. Rolla Tryon from routine curatorial duties. Dr. Tryon's *Fern Flora of Peru* continues to go forward under the sponsorship of the National Science Foundation. He and his wife, Dr. Alice Tryon, who is assisting him in this work, returned from Peru the last week in November. They report an interesting and profitable visit spent partly in the field and partly in working with Peruvian scientists in their own institutions. Dr. Tryon's Flora will be the first complete consideration of the ferns of any large tropical area.

Of the staff and students at the Garden during the last few years, the following have received new appointments: Dr. Reino O. Alava, formerly Rosarian at the Garden, is now in the department of botany, University of California, Berkeley.

Dr. Harold Kidd is at the Pioneer Hi-Bred Corn Company experiment station at Manhattan, Kansas. Dr. Edward L. Davis, who studied hops under a special fellowship from the Brewing Industries, has returned to the University of Massachusetts, Amherst, where, in addition to teaching, he will continue his research on hops. Dr. Lawrence Kaplan, who completed his graduate work at the Garden under Dr. Hugh C. Cutler and received his degree from the University of Chicago in June, is professor of Biology at Wright Junior College, Chicago. Dr. A. S. Rao, who studied the genus Rauvolfia under a fellowship from Ciba Pharmaceutical Products Inc., has taken a position in the botany department at the University of Toronto, Toronto, Canada. Dr. Ding Hou, who last year assisted in the publication of a Flora of China at the Arnold Arboretum of Harvard University, has accepted an appointment in Leyden, Holland to work with van Steenis on the Flora of Malesiana. Word has been received that Dr. Nalini Nirodi is now on the staff of the Indian Agricultural Research Institute, New Delhi, India. The herbarium assistant during 1955-56, Mr. George Eiten, has returned to the New York Botanical Garden where he will continue work toward his doctorate. Dr. Bernard Mikula is at Madison, Wisconsin, in the botany department of the University of Wisconsin.

A graduate student from Claremont College, California, Mr. Calaway H. Dodson, is completing a four months' study of the orchid collection as a part of his research under a scholarship grant from the Garden Clubs of Missouri.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (spring to fall) and until six (in the winter time) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.